

# Do Websites Serve Our Patients Well? A Comparative Analysis of Online Information on Cosmetic Injectables

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PATIENT  
SAFETY

**Background:** Patients access online cosmetic health information to help with decision making. This information is unregulated, variable in quality, and may be biased. This study compared the most popular cosmetic injectables websites to assess their readability, quality, and technical performance.

**Methods:** A Google search for “Botox” (botulinum toxin type A) and “fillers” was performed in July of 2020, identifying the most popular health information websites. Sites were analyzed for their readability and quality of health information using the validated DISCERN criteria and the Health on the Net Foundation Code of Conduct principles. Technical qualities were evaluated using two website performance algorithms, WooRank and WebsiteGrader.

**Results:** Eighty-five websites were analyzed (13 academic/hospital websites, seven commercial websites, 25 private practice board-certified websites, seven private practice not-board-certified websites, 16 online health reference websites, and 17 other websites). The mean readability consensus score was 11 (eleventh grade reading level). The mean DISCERN quality scores were higher for online health reference websites compared to academic/hospital websites ( $p = 0.045$ ), commercial websites ( $p = 0.045$ ), private practice board-certified websites ( $p < 0.001$ ), and private practice not-board-certified websites ( $p = .002$ ). No correlation between a website’s rank and its DISCERN score was found ( $\rho = -0.07$ ;  $p = 0.49$ ).

**Conclusions:** Cosmetic injectable websites are too difficult to read by the sixth grade standard recommended by the National Institutes of Health and the American Medical Association. Online health reference sites are higher in quality than physician sites. This has implications for the ability of many patients to be fully informed consumers. The readability, quality, and technical aspects of websites may affect the overall accessibility of patient health information. (*Plast. Reconstr. Surg.* 149: 655e, 2022.)

The usage of online health information has increased with the rapid advance of modern technology. The widespread access of the internet has allowed for increasing availability of health information resources, which are heavily utilized by patients. Eight in 10 Americans who use the internet search online for health information.<sup>1</sup> Furthermore, an association exists between a patient reading online health information and their subsequent medical decision making.<sup>2</sup> Unfortunately, online health information

is not regulated, and resources often lack scientific credibility. The importance of credible and

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comprehensible online health information is, therefore, essential to patient safety, decision-making, and informed consent.<sup>4</sup>

In regard to cosmetic patients, 95 percent utilize the internet to collect information before entering a physician's office.<sup>5</sup> For 68 percent of these patients, it is their initial search method.<sup>5</sup> These online health resources are informative but can be biased toward potentially presenting important details, such as risks and limitations, in a cursory manner that creates unrealistic expectations while minimizing risks. This can subsequently increase consultation times as physicians need to disprove misconceptions, while negatively impacting physician-patient trust.

Injectable neuromodulators were the most performed cosmetic procedures in the United States in 2019, with more than 7.7 million procedures performed.<sup>6</sup> Soft-tissue filler injections were the second most often performed procedures at more than 2.7 million.<sup>6</sup> The rate of use of minimally invasive cosmetic procedures is growing faster than any other procedure within cosmetic surgery.<sup>6</sup> The readability and quality of health information surrounding these procedures are important as the market continues to expand and more patients access online health information to make medical decisions.<sup>6</sup>

Approximately one-third of cosmetic patients identify as having no more than a high school level of education.<sup>7</sup> This may impact their understanding of the complex medical jargon that can be used to detail the risks, benefits, and limitations of cosmetic procedures. Older patients and those of lower socioeconomic status have been shown to more readily trust their physicians.<sup>8</sup> In cosmetic surgery, this trust matters even more, as the financial implications are much more substantial. The National Institutes of Health and the American Medical Association recommend a sixth grade reading level for health information to ensure patients of all educational and socioeconomic backgrounds are able to understand and make medical decisions in a truly informed manner. Cosmetic product and equipment companies are known for their widespread marketing, which may expose patients to unbalanced health information, minimized risks, and overstated benefits. Although cosmetic medicine has many benefits, it can also lead to serious complications that leave patients with regret.<sup>9-12</sup> Cosmetic injectables, for example, can cause pain, bleeding, swelling, bruising, skin necrosis, infection, asymmetry, and granulomas.<sup>13</sup> In addition, filler-associated blindness remains a devastating complication and requires

urgent action by the patient.<sup>14</sup> This emphasizes the need for readable, high-quality, and technically accessible information made to protect the health and safety of all patients.

Previous studies have already highlighted the poor readability and mediocre quality of online information for various medical topics.<sup>15-21</sup> The objective of this study was to not only assess the readability and quality of online health information as it relates to cosmetic injectables, but also discover which websites are better than others and what technical aspects are necessary to make sites more accessible. Despite the popularity of these procedures on social media and the lay press, very little research has been done to determine whether consumers are being presented with information online that conveys more than just the positive, glamorous aspects of these medical procedures. This is the first study to assess all of these aspects for the two most often performed cosmetic procedures in the United States. This study conforms to the Declaration of Helsinki.

## METHODS

Online health information sources were identified using the Google search engine. Location filters were set to the United States, and all other advertising personalization features were disabled to allow for results most often encountered by those searching within the United States. The search phrases "Botox" and "fillers" were each used to gather a list of the top 50 websites. From these 50 websites, noneducational resources, videos, and irrelevant sites were excluded. Websites were categorized as academic/hospital websites, commercial websites, private practice board-certified websites, private practice not-board-certified websites, online health reference websites, and other websites. The other websites category consisted of online health information articles, government websites, social media, and news articles. Private practice board-certified websites included sites with physicians with board certification in plastic surgery or dermatology.

Readability measures were performed using eight established tests used often by schoolteachers to help determine reading difficulty. These formulas include the Flesch Reading Ease score, Gunning Fog Index, Flesch-Kincaid Grade Level, Coleman-Liau Index, Simple Measure of Gobbledygook Readability Formula, Automated Readability Index, Linsear Write formula, and Fry score. (See Table, Supplemental Digital Content 1, which describes each formula and the qualities

assessed, <http://links.lww.com/PRS/E946>.) These formulas consider sentence lengths, syllables, easy words, difficult words, and characters in words to assign a grade level to the reading material, or a score range for Flesch Reading Ease, with a higher score corresponding to easier reading material. A readability consensus score considers the scores of all of the aforementioned formulas to generate a composite grade-level score. Finally, a Fry plot was created using sentence length and number of syllables. Readability Studio Professional 2020 (Oleander Software Ltd., Hadapsar, India) and an online readability software were used to calculate all scores.<sup>22</sup>

The quality of websites was assessed using the validated DISCERN instrument, an established tool developed to help assess the quality of consumer health materials.<sup>23</sup> The 16-item questionnaire is divided into three sections. The first section consists of eight questions that evaluate the publication's reliability. The second section consists of seven questions that evaluate the quality of information on treatment choices, risks, and side effects. The final section is one question that assesses the overall quality of the publication based on the previous 15 criteria.<sup>24</sup> All questions were scored on a scale of 1 to 5, where 5 indicates superior quality. The Health on the Net Foundation Code of Conduct was further used to assess quality.<sup>25</sup> The Health on the Net Foundation Code of Conduct is a code of ethical conduct that consists of eight principles that promote reliable health and medical information on the internet. It is one of the oldest and most widely accepted references for online health and medical publishers. The code has been used to certify more than 7300 websites throughout more than 100 countries.<sup>26</sup> A scoring method was created based on the principles of authority, complementarity, confidentiality, attribution, justifiability, transparency, financial disclosure, and advertising. A website was scored from 0 to 2 for each principle, with a score of 0 for nonadherence, 1 for partial adherence, and 2 for complete adherence. A score of 16 signifies complete adherence to all eight principles.

The technical analysis of a website was performed with two widely used online programs: WebsiteGrader and WooRank. Website designers and online marketers utilize these programs to evaluate the technical performance of their websites and content. WebsiteGrader assigns a score out of a 100 based on its performance (30 points), search engine optimization (30 points), mobile performance (30 points), and security (10 points).<sup>27</sup> WooRank assigns a score out of 100

based on content, indexing, mobile-friendliness, structured data, security, performance, technologies, branding, domain, backlinks, traffic, and social media engagement.<sup>28</sup>

The readability, quality, and technical analysis data were collected by three of the authors (A.P., C.J., and J.V.). Several studies evaluating online health information in plastic surgery have used similar readability and quality assessments.<sup>15,16,19,29</sup> One other study has investigated technical aspects of online health information with WebsiteGrader.<sup>16</sup>

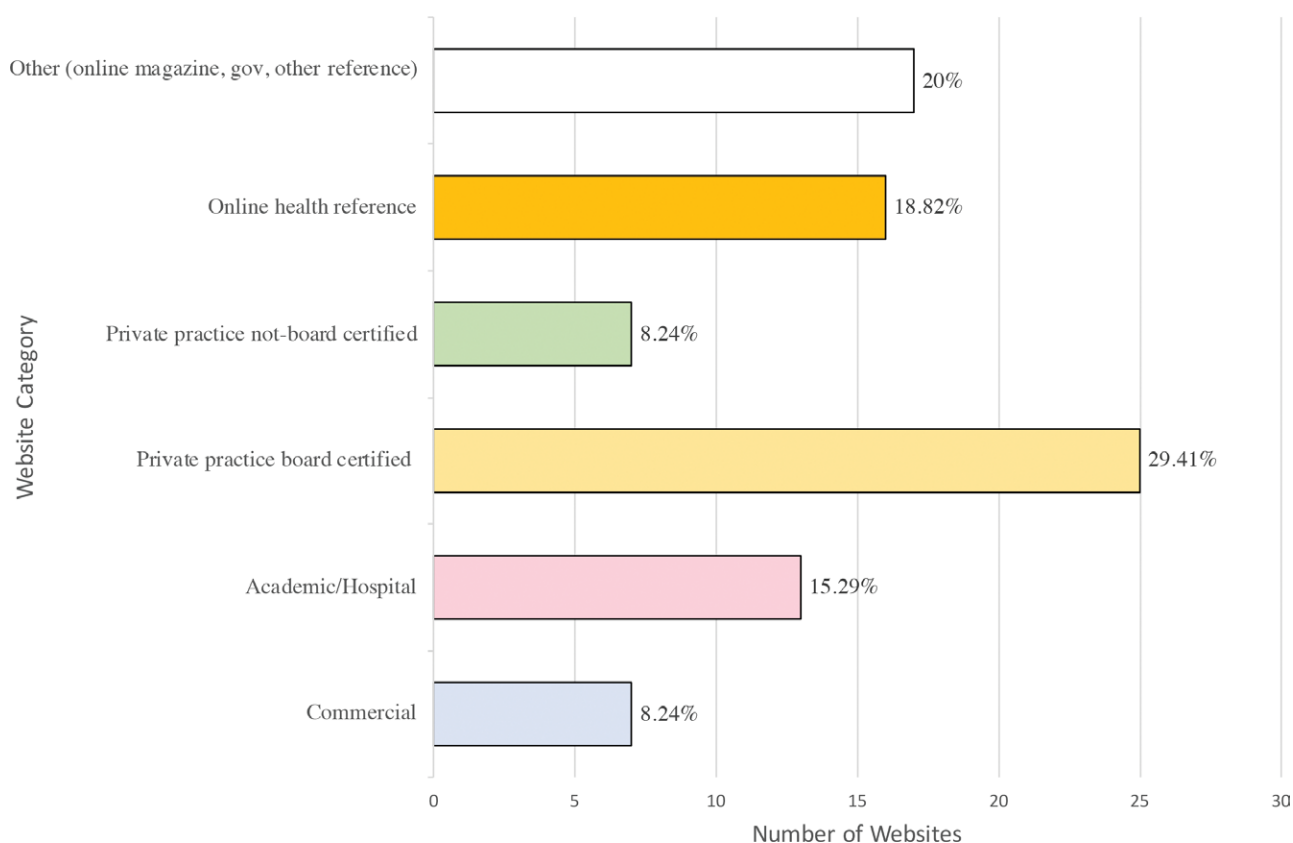
### Statistical Analysis

The Kruskal-Wallis test was used to compare variables from nonnormally distributed data of unequal sample sizes. A statistically significant result was further investigated by multiple pairwise comparisons, using the Wilcoxon rank sum test. A *p* value less than 0.05 was deemed statistically significant. The *p* value adjustments were made using the Benjamini-Hochberg correction to reduce the false discovery rate. A Spearman correlation was performed on a website's Google search rank against its quality and readability scores. Descriptive statistics, including the mean, standard deviation, and median, were tabulated for each website group. All data analysis was conducted in R software version 4.0.2 (R Core Team, Vienna, Austria).

## RESULTS

A total of 85 websites from a "Botox" and "fillers" Google search were analyzed. Seven websites (8 percent) were classified as commercial websites. Thirteen (15 percent) originated from academic/hospital websites. Twenty-five (29 percent) were from private practice board-certified websites. Seven (8 percent) were private practice not-board-certified websites. Sixteen websites (19 percent) were from online health reference websites. Seventeen (20 percent) were categorized as other websites, which comprised online magazine articles, government websites, and other non-health-related reference sites (Fig. 1).

The mean readability scores from all websites were compared to the National Institutes of Health and American Medical Association recommended grade 6 reading level<sup>30,31</sup> (Fig. 2). The mean scores showed all websites to be at a more difficult reading level compared to the recommended, for each metric. A Fry plot was constructed to visualize the distribution in grade level scores for each website category (Fig. 3).



**Fig. 1.** Website categorization.

Website categories were compared for statistical differences for readability, quality, and technical metrics (Table 1). Online health reference websites (58.4,  $p < 0.001$ ) had statistically significant higher DISCERN scores than all other groups (Table 2). Academic/hospital websites (49.8) had statistically significant higher DISCERN scores than private practice board-certified websites (36.8,  $p = 0.003$ ) and private practice not-board-certified websites (34.1,  $p = 0.013$ ). A box plot illustrates the differences in total DISCERN scores for all categories (Fig. 4).

Health on the Net Foundation Code of Conduct scores were higher for online health reference websites (10.2) in comparison to private practice board-certified websites (4.16,  $p = 0.00003$ ) and private practice not-board-certified websites (4.29,  $p = 0.0075$ ).

WooRank scores were lower for commercial websites (63.3) compared to online health reference websites (77.8,  $p = 0.03$ ) and other websites (81.3,  $p = 0.02$ ) websites. WebsiteGrader scores were also lower for commercial websites (60.1) compared to online health reference websites (73.3,  $p = 0.0485$ ) and other websites (76.9,  $p = 0.0485$ ).

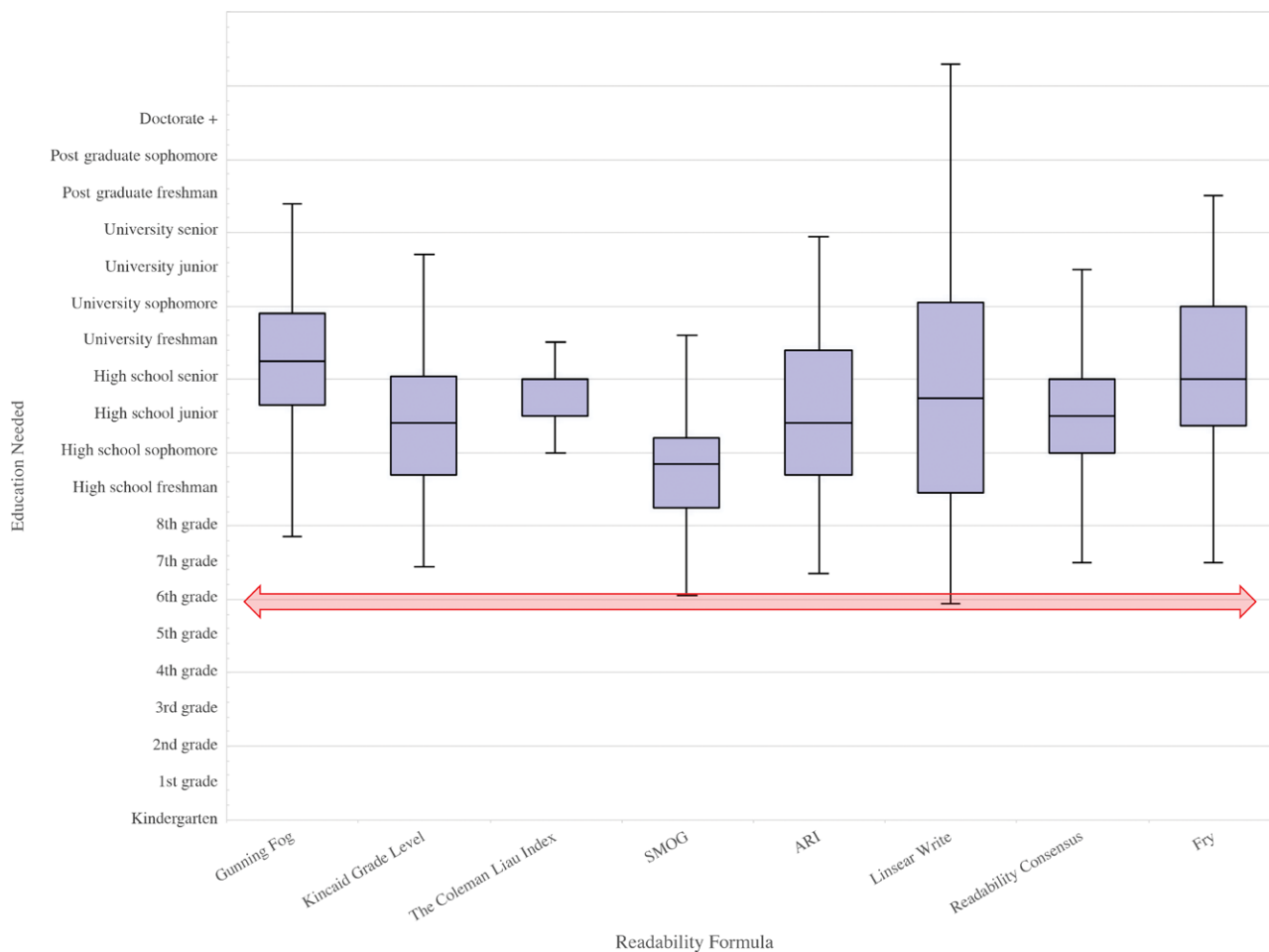
The rank of a website on Google search was not correlated with DISCERN scores, as shown by a Spearman coefficient of  $\rho = -0.07$  ( $p = 0.49$ ) (Fig. 5). Website rank was also not correlated with readability consensus scores of  $\rho = 0.1$  ( $p = 0.34$ ).

The mean, standard deviation, median, and range for the readability, quality, and technical scores were calculated for each website category. (See Table, Supplemental Digital Content 2, which details descriptive statistics of readability, quality, and technical metrics by website category, <http://links.lww.com/PRS/E947>.)

## DISCUSSION

To our knowledge, this study is the first to look at multiple readability, quality, and technical metrics to compare different categories of online cosmetic injectable websites. The majority of plastic surgery-related online readability studies have looked at readability metrics alone, but few have looked into the quality and even fewer into technical aspects of websites. The majority of this literature has focused on information related to invasive surgical procedures, not the more popular and dramatically increasing minimally invasive





**Fig. 2.** Readability scores from “Botox” and “fillers” websites versus recommended grade 6 reading score. *SMOG*, Simple Measure of Gobbledygook; *ARI*, Automated Readability Index.

office procedures, such as neuromodulators and fillers.<sup>16,19,21,29,32</sup> This study is also the first to assess the performance of different classes of websites from different groups and to offer an algorithm on website optimization (Fig. 6).

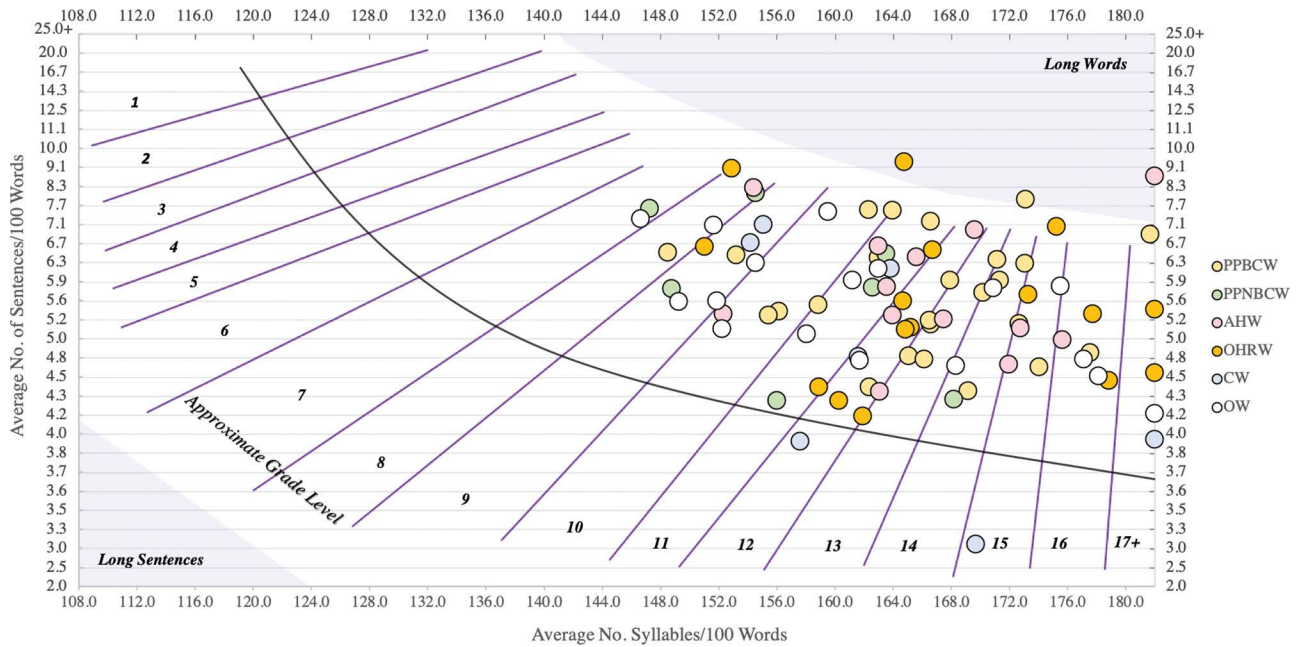
**Readability**

The readability scores from each formula showed that websites describing health information related to neuromodulators and fillers were uniformly higher than the sixth grade reading level recommended by the National Institutes of Health and the American Medical Association.<sup>30,31</sup> These results conform with several other readability studies on plastic surgery procedures that found online website readability levels to be uniformly too difficult for all patients to truly understand.<sup>15,16,19,29,32</sup> Of note, most of these other readability studies were on technically complex surgical procedures that are sometimes difficult to explain without resorting to technical language.

Neuromodulators and fillers are relatively simpler in-office procedures and intuitively should be easier to explain, yet these websites remain at difficult readability levels, suggesting that the technical complexity of the procedure is not related to its online readability scores. There was no difference in readability across the various categories of websites. This indicates that websites targeted explicitly to patients such as hospitals, private practice physicians, or online health consumer sites were not necessarily more accessible than reference sites geared toward scientific professionals. The need to simplify language, use fewer complex words, and to shorten sentences is essential in delivering access to online health information that can be understood by patients regardless of their level of education (Table 3).

**Quality**

Average quality scores for all websites analyzed were low: DISCERN total 44.4 out of 80



**Fig. 3.** Fry Readability graph assessment of all website categories. *PPBCW*, private practice board-certified websites; *PPNBCW*, private practice not-board-certified websites; *AHW*, academic or hospital websites; *OHRW*, online health reference websites; *CW*, commercial websites; *OW*, other websites. *Shaded areas* represent invalid scores.

(SD, 12.6) and Health on the Net Foundation Code of Conduct of 6.54 out of 16 (SD, 3.76). Multiple other studies using the DISCERN instrument to assess the quality of online health materials have also found scores to be low on the topics of chronic pain, rhinoplasty, and neck lift.<sup>16,33,34</sup> Interestingly, a difference in DISCERN and Health

on the Net Foundation Code of Conduct quality scores was detected among the various website categories, suggesting that certain categories of websites may be better at conveying quality health information (Fig. 3). Online health reference websites were superior to other categories in quality metrics. Online health reference websites, such

**Table 1. Differences in Quality, Readability, and Technical Metrics of all Website Categories**

Metric	Median Score (IQR)						Overall	p
	AHW	CW	OHRW	OW	PPBCW	PPNBCW		
Readability consensus	11.0 (2.0)	12.0 (6.5)	11.5 (3.0)	10.0 (3.0)	11.0 (2.0)	10.0 (3.0)	11.0 (2.0)	0.73
DISCERN total	48.0 (16.0)	38.0 (21.5)	60.0 (8.75)	45.0 (21.0)	37.0 (14.0)	33.0 (10.0)	44.0 (23.0)	<0.001
HONcode	6.0 (6.0)	5.0 (3.0)	10.5 (3.5)	7.0 (7.0)	4.0 (2.0)	4.0 (2.0)	5.0 (6.0)	<0.001
WooRank	76.0 (7.0)	66.0 (12.0)	81.0 (11.5)	83.0 (5.0)	68.0 (13.0)	68.0 (7.0)	74.0 (17.0)	<0.001
WebsiteGrader	72.0 (16.0)	63.0 (12.0)	74.0 (8.3)	76.0 (11.0)	66.0 (15.0)	68.0 (7.5)	72.0 (16.0)	0.01

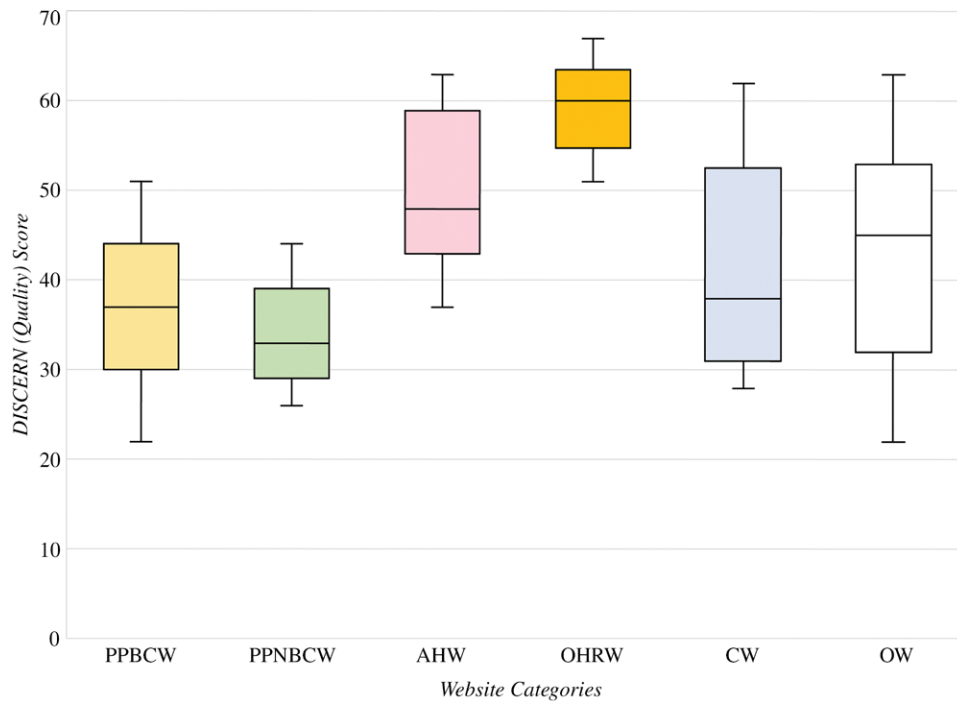
IQR, interquartile range; HONcode, Health on the Net Foundation Code of Conduct; PPBCW, private practice board-certified websites; PPNBCW, private practice not-board-certified websites; AHW, academic or hospital websites; OHRW, online health reference websites; CW, commercial websites; OW, other websites.

**Table 2. Pairwise Wilcoxon Rank Sum p Values Highlighting Individual Group Differences in DISCERN for Injectable Website Categories**

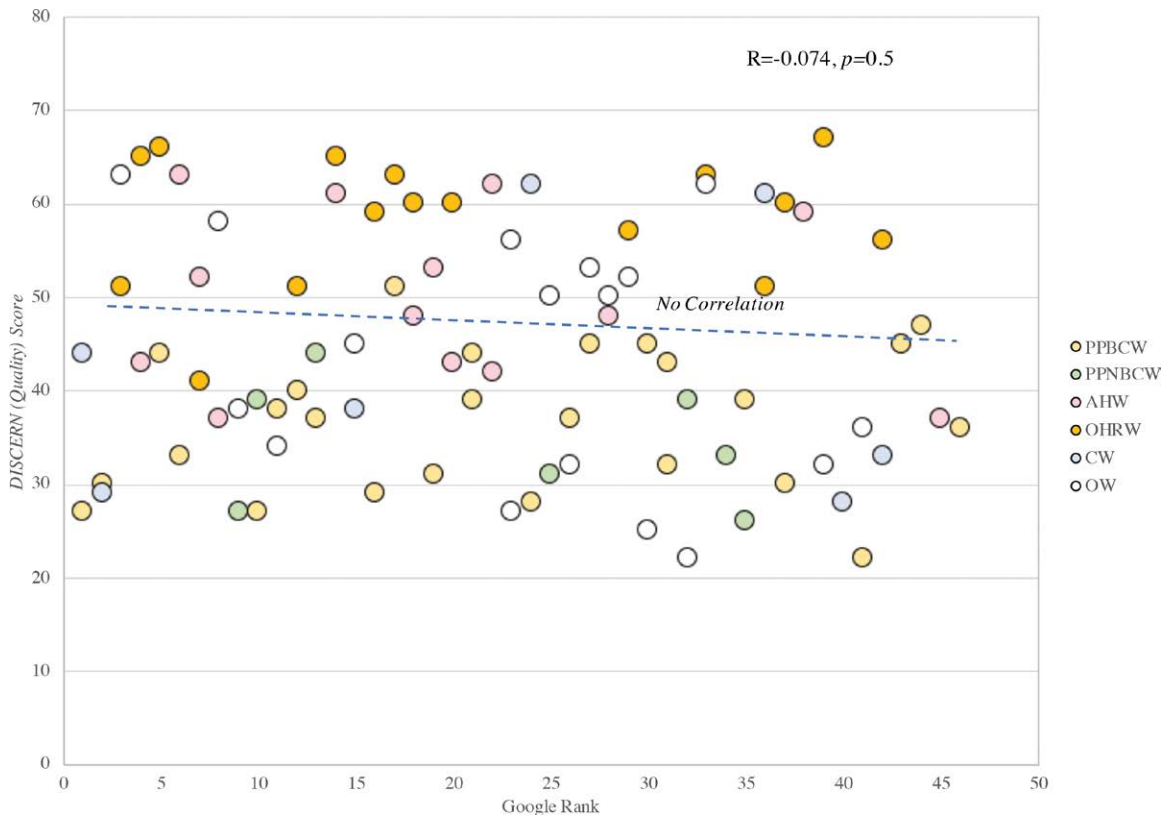
	AHW	CW	OHRW	OW	PPBCW
CW	0.278	NA	NA	NA	NA
OHRW	0.045*	0.045*	NA	NA	NA
OW	0.278	0.899	0.003*	NA	NA
PPBCW	0.003*	0.626	<0.001*	0.221	NA
PPNBCW	0.013*	0.462	0.002*	0.254	0.475

PPBCW, private practice board-certified websites; PPNBCW, private practice not-board-certified websites; AHW, academic or hospital websites; OHRW, online health reference websites; CW, commercial websites; OW, other websites; NA, not applicable.

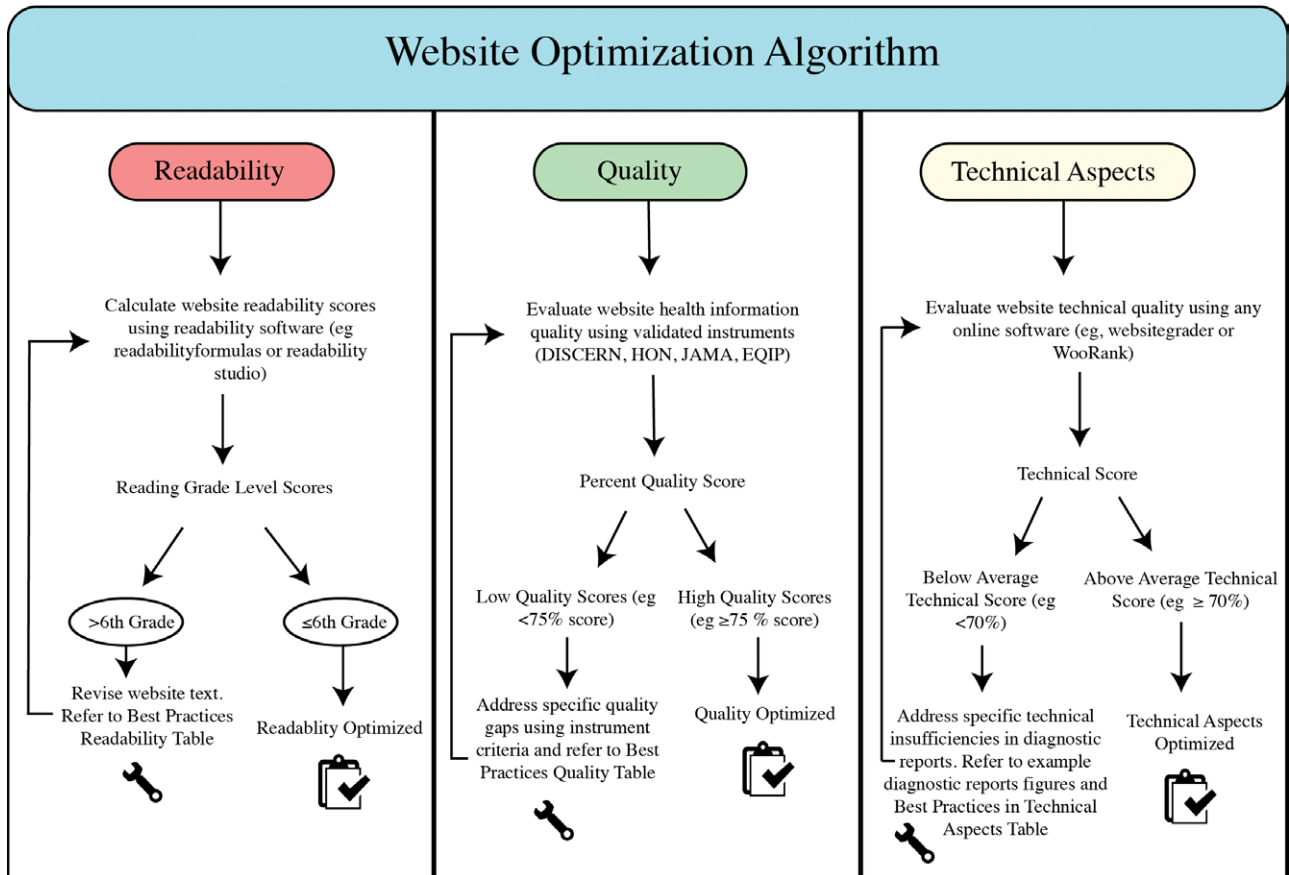
\*Statistically significant  $p < 0.05$ .



**Fig. 4.** Comparison of DISCERN scores for website categories. *PPBCW*, private practice board-certified websites; *PPNBCW*, private practice not-board-certified websites; *AHW*, academic or hospital websites; *OHRW*, online health reference websites; *CW*, commercial websites; *OW*, other websites.



**Fig. 5.** Spearman correlation of Google search rank versus a website's DISCERN score. The Google rank algorithm does not necessarily factor in a website's health information quality, which may have implications in appropriately informing patients. *PPBCW*, private practice board-certified websites; *PPNBCW*, private practice not-board-certified websites; *AHW*, academic or hospital websites; *OHRW*, online health reference websites; *CW*, commercial websites; *OW*, other websites.



**Fig. 6.** Actionable steps algorithm to optimize website readability, quality, and technical aspects. Utilization of a website optimization algorithm may serve to improve the current state of cosmetic injectable sites. *HON*, Health on the Net Foundation Code of Conduct; *JAMA*, *Journal of the American Medical Association*; *EQIP*, Ensuring Quality Information for Patients.

as healthline.com, webmd.com, medlineplus.gov, medicinenet.com, thehealthy.com, drugs.com, rxlist.com, and medicalnewstoday.com, are targeted toward patients and seem to have higher-quality neuromodulator and filler articles. Academic and hospital-based websites, such as plasticsurgery.org, mayoclinic.org, facialesthetics.org, aao.org, and aad.org, seem to have higher-quality health materials than private practice physician websites but lower quality than online health reference websites. Table 4 illustrates examples of ways to improve a website's quality.

Physician-based websites, regardless of board certification, seem to be of inferior quality relative to other sites. The reasons for this merit investigation but may be because of the bias of marketing pressures, wherein there is a disincentive to highlight key risks and side effects and an incentive to focus mostly on the glamour of cosmetic procedures.<sup>35–38</sup> For the practitioner who wishes to properly explain risks, this may potentially be thought to place an inherent strain on the physician-patient relationship, affecting trust, and

the default response may be to not discuss this at all on the website. In addition, some private practitioners may have limited resources, making it difficult to dedicate time to strengthening online educational materials. They may not have access to research assistants, medical students, residents, or fellows who can help support a practice. Patients are vulnerable to reading conflicting information online, making them question, during a consultation, the expertise of a cosmetic physician, who may provide different information from what is found online.<sup>39,40</sup> There is much controversy regarding the safety and overall medical care delivered by non-board-certified plastic surgeons and dermatologists. However, the similarity in the quality of health content on their websites suggests that board-certified physicians are not educating patients any better online.

The quality and readability indices of a website were found to not correlate with its Google search rank. Google advertisements were often the first websites to appear. The ranking algorithm of websites is complex and may be financially motivated,



**Table 3. Best Practices to Improve a Website’s Readability**

Goals	Higher Readability Examples	Lower Readability Examples
Give most important information first	Example: Botox is a proven treatment for fine lines, wrinkles, and other cosmetic concerns many people have with age.	Example: Botox is a drug made from a toxin produced by the bacterium <i>Clostridium botulinum</i> .
Keep it short. Use words with one or two syllables. Keep sentences between eight to 10 words. Keep paragraphs between three to five sentences.	Multiple short sentences with fewer words that have fewer syllables. Example: Fillers are similar to gels that can be injected beneath the skin. They restore volume and smooth lines.	Long sentences with many words with many syllables. Example: A wide variety of injectable soft-tissue fillers are available for clinical use, including biodegradable products (hyaluronic acid, collagen, calcium hydroxyapatite, and poly-L-lactic acid), products that remain indefinitely in tissue, and viable autologous fat. Soft-tissue fillers are used for multiple cosmetic and therapeutic indications.
Communicate as if you were talking to a friend.	You may have pain, swelling, and bruising after treatment.	Pain localized to the injection site, edema, and ecchymosis could be potential side effects from the use of Botox.
Offer examples	Fillers can be used to smooth wrinkles, plump the lips, and restore volume to sunken cheeks or temples.	Soft-tissue fillers are used for multiple cosmetic and therapeutic indications.
Limit use of jargon, technical, or scientific language.	Botox can stop a specific muscle from working.	Onobotulinumtoxin A injection is a neuromodulator that prevents the release of acetylcholine and thereby prevents muscle contraction.
Be consistent with word choice.	Use the treatment name “Botox” or “fillers” consistently throughout the written material.	Botox, neuromodulators, and muscle paralyzers may have the same meaning, but it is important to stay consistent to prevent confusing the reader.
Use visuals or illustrations when possible.	When describing Botox or filler treatment, insert a video, image, or illustration of treatment administration to help the reader understand the procedure.	Large blocks of text with no images, illustrations, or visuals makes it difficult for the reader to stay engaged and understand.
Use active voice instead of passive.	Example: Fillers may cause swelling and bruising.	Example: Swelling and bruising may be a side effect of soft-tissue fillers.
Organize website for easy-to-read layout. Bullet points may help with focus.	Use appropriate titles, and headers to organize the website. Listing important bullet points may help readers focus their attention. Example headers: “Benefits of Botox,” “Side effects of Botox.” Example bullets: Botox can treat the following: <ul style="list-style-type: none"> <li>• Facial wrinkles</li> <li>• Underarm sweating</li> <li>• Neck and shoulder contractions</li> <li>• Uncontrollable blinking</li> <li>• Misaligned eyes</li> <li>• Migraine</li> <li>• Overactive bladder</li> </ul>	Not using appropriate headers or titles may make it difficult for readers to follow along. Important information may be lost in a sea of text without appropriate bullet points. Example: Botulinum toxin type A has several indications. It may benefit those with facial wrinkles. In addition, it can be used to treat hyperhidrosis...

which deprioritizes the safety and reliability of online health information.

**Technical Aspects**

With increasing access to online cosmetic websites, the technical performance of a website becomes essential. Websites can take user information for advertising and marketing purposes, which makes a site’s security important. Privacy concerns are becoming more of a concern for patients. Pop-ups and advertisements can distract patients from important health information. Slow loading times

and poor search engine optimization can lead to the loss and inaccessibility of high-quality health information.<sup>41</sup> WooRank and WebsiteGrader scores help evaluate all of these aspects in addition to social media and mobile-friendliness. The analysis conducted on neuromodulators and filler websites showed that the overall mean (SD) WooRank scores were 73.8 out of 100 (11.3). A score of 70 or higher is deemed “well-optimized” for a user and sufficient in many of the aspects described but may still benefit from improvement.<sup>28</sup> The overall mean WebsiteGrader scores were 70.8 out of 100

**Table 4. Best Practices to Improve a Website's Health Information Quality**

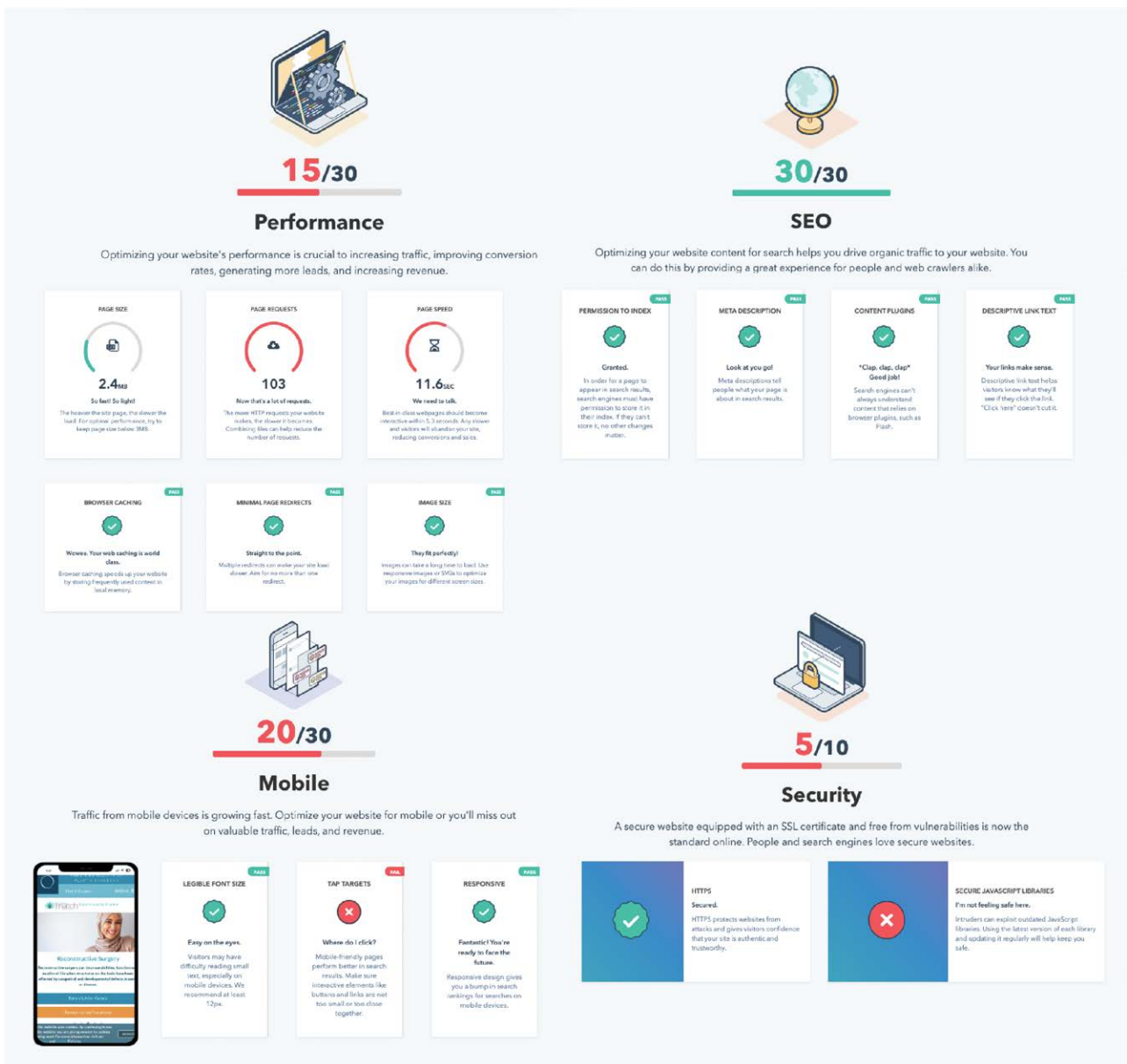
Goals	Higher Quality	Lower Quality
State clear aims. Answer questions such as what the information is about, what it is meant to cover, and who may find it useful.	Example: Title: Soft-tissue fillers, benefits, risks, and important considerations. This article pertains to soft-tissue filler treatment. It is meant to describe how the treatment works, the benefits, risks, and important considerations. People who are interested in improving their cosmetic appearance may benefit from this article.	Example: Title: Soft-Tissue Fillers Soft-tissue fillers are made from... Title is broad and introduction does not explain the article's purpose.
Describe relevant information. Answers questions that readers may ask: What are fillers? Who are they recommended for? How do I get treatment? What are the benefits? What are the risks? What is the expected downtime? How long will treatment benefits last?	Answers all relevant questions that a patient may have in a thorough manner.	Provides information that is too technical, extraneous, or irrelevant to a potential patient. Omits or provides incomplete relevant information.
Provide sources and links to additional information. Clearly reference sources of information.	Cites references for statements requiring evidence. Also provides additional sources for support. Example: According to [insert study/source/link], Botox may improve forehead lines, crow's feet, and frown lines between the eyebrows in adults. For additional information about Botox please visit [insert link].	Makes claims and statements with no clear source. Does not link reader to additional information.
State date of publication.	Provides date of publication and dates of relevant sources.	Gives no indication to the date of information (copyright data).
Remain balanced and unbiased.	Provides author's credentials and purpose. Cites evidence from a wide range of sources of information. Provides multiple viewpoints for treatment options. Example: Botox may help to smooth out wrinkles. However, other treatments options exist that may be better depending on the location and extent of the wrinkles. Chemical peels, fillers, laser resurfacing, and microdermabrasion also help smoothen wrinkles.	Does not provide author background. Does not provide any evidence or cites only one study or source. Provides a single viewpoint for the treatment option. Example: Botox is considered the most effective treatment option in reducing forehead wrinkles.
Describe areas of uncertainty.	Example: Although, there is some evidence that antiplatelet therapy may be continued safely in the perioperative period, patients are generally counseled to stop anti-inflammatory and antiplatelet agents a week before treatment to minimize bruising. Please talk to your provider if you are taking any anti-inflammatory or antiplatelet agents to help guide your treatment.	Does not mention areas of uncertainty as they relate to treatment benefits, risks, or complications.
Describe how treatment works.	Example: Botox is a toxin derived from a bacterium that safely stops your forehead muscles from working as hard. This reduces the appearance of forehead wrinkles.	Assumes the reader already knows and omits the information.
Describe treatment benefit.	Provides the benefits of a treatment option in a balanced manner.	Most sources describe the benefits well but fail to provide a balanced approach.
Describe risks of treatment.	States not only the common but also rare and serious side effects. Gives an estimation to their likelihood.	Provides no or only a few risks of treatment and an estimation of their likelihood.
Describe what would happen if no treatment is used.	Example: Without the use of Botox, forehead wrinkles may stay the same or get worse with time.	Omits.
Describe how the treatment choices affect overall quality of life.	Example: Soft-tissue filler treatment may give you a younger-looking appearance that may improve your confidence and possible quality of life.	Omits.
Provide support for shared decision-making.	Supports shared decision-making. Example: Please contact your physician for more information on filler treatment and to decide whether filler treatment is right for you.	Offers minimal support in shared decision-making and seems as if the website is simply trying to sell a product. Example: Schedule your appointment now to receive a filler treatment.

(10.4); this is slightly higher than the average website in 2020, which received a D+ (67 out of 100).<sup>41</sup> Although these overall scores provide a rough analysis of a website’s technical quality, a plastic surgery cosmetic website should utilize these online software programs to generate a comprehensive report to identify and address a website’s weakness (Figs. 7 through 9), as a higher scored website is more accessible, safer, and well-integrated with social media. Table 5 highlights the best practices to improve a website’s technical features, and Figure 9 illustrates the importance of utilizing appropriate keywords for search engines. Technical accessibility, in

addition to high quality and readability, helps present cosmetic information to a wider demographic.

**Limitations**

There are several limitations to this study involving the challenge of accurately capturing and assessing online data. Only the first 50 websites generated by a “Botox” and “fillers” keyword search from Google were analyzed. Patients can also access other search engines and sites with lower ranking sites. In addition, all conclusions generated in this study are confined to only online materials for Botox and fillers. The differences

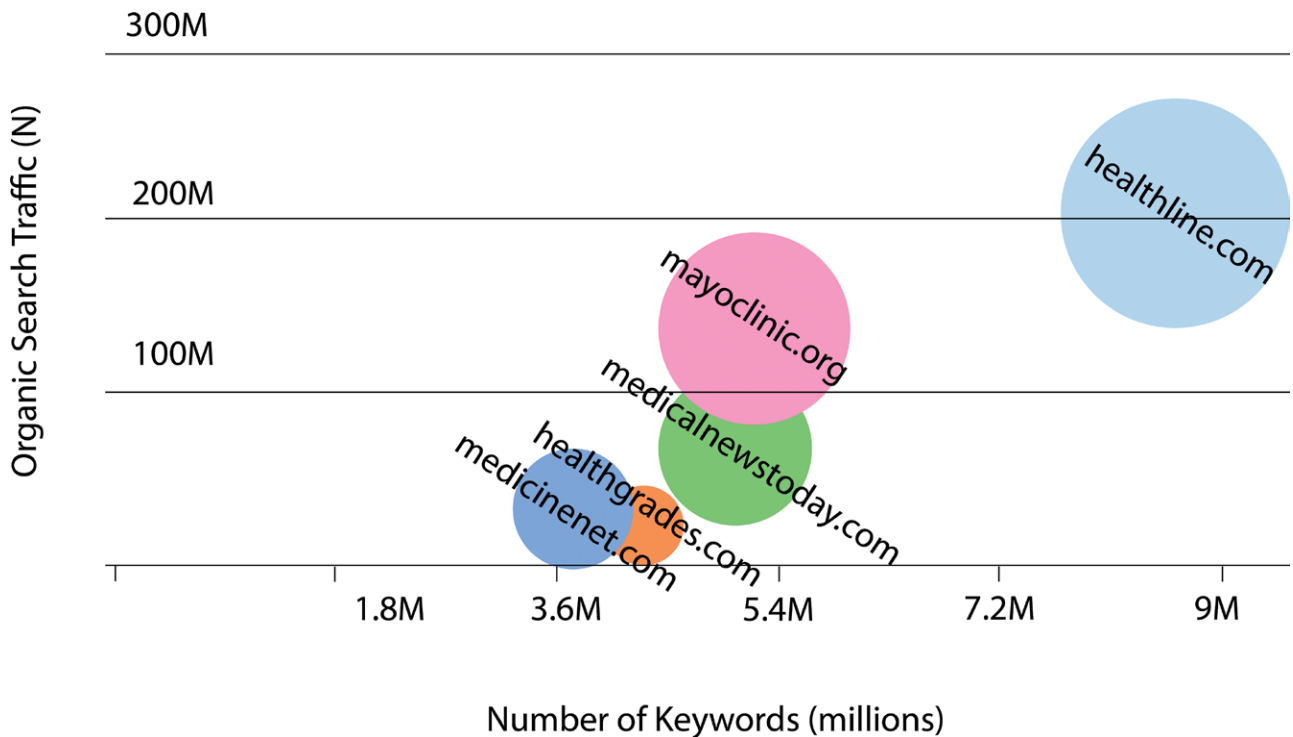


**Fig. 7.** Example of technical aspects diagnostics report. This report was generated from website.grader.com. A diagnostic report of their website may help health providers engage in more meaningful conversations with their website design team.

## What should I do next?

Performance	CURRENT		RECOMMENDATION
Page requests	86	<30	Combine files to minimize number of HTTP requests your site makes.
Page speed	10.3 Sec	<5.3 Sec	Speed up your site by lightening up your site pages, compressing images and video where possible.
Mobile	CURRENT		RECOMMENDATION
Tap Targets	No	Yes	Tap targets (e.g., links and buttons) should be at least 8px apart from each other, and at least 48px wide and 48px tall so they are clickable for mobile users
Security	CURRENT		RECOMMENDATION
Secure JavaScript libraries	No	Yes	Remove the JavaScript library or update it with a security patch.

**Fig. 8.** Example of next steps report. This report was generated from website.grader.com. These reports should be communicated to a physician’s website design team to improve on weaknesses.



**Fig. 9.** Competitive positioning map, highlighting the importance of keywords in increasing organic search traffic (traffic to a website without the use of paid advertisements). In this example, webmd.com and its close competitors are compared using an online software designed to assess a website’s traffic (SEMrush.com). Increasing the number of keywords may improve organic search traffic.

**Table 5. Best Practices to Improve a Website’s Technical Aspects**

Technical Aspect	Definition	Ways to Improve
Performance	Faster loading times, lower file sized pages, appropriate image sizes, minimal page redirects, and browser caching all improve a site’s performance.	Use various online website software to gain insight into site performance. WebsiteGrader, and WooRank are possible options. Lower initial file sizes on a webpage and consolidating files to lower http requests may improve loading times. Compress image files and resize them appropriately
Search engine optimization	A website’s ability to be easily accessed by viewers and indexed on various search engines by appropriate search terms	Improve site content by adding more visuals. Consider paid advertising. Use specific keywords in website headings. Increase the number of sites that link to your site by collaborating through social media or blogs.
Mobile friendliness	Viewer experience when viewing from a mobile browser. Legible font size, tap targets, and responsiveness increase friendliness.	Offer adequate-sized links where viewers can tap to navigate through the site. Larger font size tends to be more friendly.
Security	A website that does not collect personal data from a viewer and has its own defense against attacks from intruders seeking to collect website data	Consult a website designer to ensure that a website’s security is up to standard.
Social media engagement	Integration with Twitter, Instagram, Facebook, Snapchat, and RSS feed all help increase a site’s social media engagement.	Offer icons and links to an organization’s various social media accounts.
Organic traffic	Visits to a page from a search engine without paid advertising	Increase keywords associated with search terms. Address readability and quality of a website. Address overall practice marketing.

RSS, really simple syndication.

in website categories observed in this study may not hold with other search terms, procedures, or medical treatments. Many video-based websites were excluded as there was no analyzable text, but they may still serve as a valuable online health resource. The technical metrics used in this study are novel and not yet fully validated in other studies. Further research is needed to prove their efficacy in determining technical quality.

**CONCLUSIONS**

The growing trends in cosmetic injectables warrant easy-to-read, high-quality, and technically well-performing websites. The readability of current online cosmetic injectable websites is more difficult than the recommended sixth grade reading level. Cosmetic neuromodulators and filler websites should use simpler words and concise sentences. Online health reference websites should serve as a model for physicians and online health content contributors in developing online health resources, as they are of higher quality than other types of websites. Private practice cosmetic physician websites need significant improvement in their health content. Sources of health information should be cited to establish credibility and detailed discussion of the side effects, and alternative treatments should be included online. Improving the readability, quality, and technical aspects of online cosmetic websites can strengthen the physician-patient relationship, increase patient

satisfaction, facilitate informed discussion in the office, and may increase the accessibility of quality health information to all our patients.

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