

Which Resources Are Better: Sales or Scholarly? An Assessment on the Readability, Quality, and Technical Features of Online Chemical Peel Websites

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Abstract

Background: Chemical peels are an exceedingly popular cosmetic treatment with a wide variety of suppliers, each with its own online health resource describing the procedure. With increasing reliance on the internet for medical information, it is crucial that these resources provide reliable information for patients to make informed decisions.

Objectives: The aim of this study was to examine popular chemical peel resources and determine if those that offered chemical peel treatments (Sales) had lower readability, quality of information, and technical features compared with those that did not (Scholarly).

Methods: The term “chemical peel” was searched in July 2020 and the top 50 websites were retrieved for analysis. Each resource’s readability, quality, and technical features were measured through 8 readability formulas, the DISCERN and Health on the Net Code (HONcode), and 2 website performance monitors.

Results: The 50 websites were analyzed with an average Fry readability score of 13th grade. Scholarly websites displayed higher readability than Sales (Flesch Reading Ease 54.4 > 47.4, $P = 0.047$ and Coleman-Liau Index 10.6 < 11.7, $P = 0.04$). Scholarly resources surpassed Sales both in quality (DISCERN 56.4 > 39.7, $P < 0.001$ and HONcode 11.8 > 9.5, $P = 0.032$) and technical features (WooRank 76.9 > 68.6, $P = 0.0082$).

Conclusions: The average readability of chemical peel resources is too difficult, and their quality must be improved. Scholarly resources exhibited higher readability, quality, and technical features than Sales websites.

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Chemical facial peels are a cosmetic procedure designed to improve pigmentary and inflammatory skin disorders as well as scarring, chronoaging, and precancerous lesions.^{1, 2} The Aesthetic Society reported over 78,000 chemical peel treatments performed in 2019 and was the sixth most common aesthetic nonsurgical procedure in the United States.³ Chemical peels can be categorized into superficial, medium, and deep peels with deeper peels resulting in the greatest skin change at the cost of longer healing times and possible complications.⁴ Superficial peels can be used for conditions, such as melasma, actinic keratosis, and acne, while medium and deep peels can improve scars as well as

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precancerous skin lesions.⁵ They can be further differentiated based on their formulations, including glycolic acid, salicylic acid, tretinoin, or trichloroacetic acid, each with varying degrees of skin elasticity improvement or discomfort.^{4,6} Chemical peels are offered by a number of entities: plastic surgeons, dermatologists, aestheticians working in medical spas (medspas), or commercially sold to patients for self-treatment. With this wide array of potential suppliers, it is crucial that patients are provided with reliable and accurate information on chemical peels so that they can make the most appropriate decision for their personal desires. Patients can learn more about these procedures through online health resources covering numerous medical topics including chemical peels. While access to this enormous assortment of information can help educate patients, they must be diligent when searching through online health resources. Eighty-five percent of plastic surgeons reported that patients who search for information on social media could be influenced to have unrealistic expectations with their treatment.⁷ By providing patients with accurate medical information prior to treatment, plastic surgeons can enhance posttreatment satisfaction and mitigate feelings of disappointment that can occur due to unachievable aesthetic goals.⁸ Many factors influence the overall quality of online health resources, such as the readability, the quality of information, and the technical features of the resource. The readability must be at an appropriate level for patient comprehension but still accurately describes important information regarding the treatment. To address this, the American Medical Association recommends patient-friendly material should be written at the sixth grade level.⁹ In addition, resources should provide quality information encompassing important aspects, such as benefits of treatment, risks, alternative treatments, author credibility, and utilizing quality references. The technical features of the resource should be optimized so that patients can easily discover high-quality online resources through their preferred search engine. Providing high-quality online health resources to patients will empower them to be more knowledgeable and better equipped to advocate for their personal health. We hypothesized that resources provided by organizations that offered chemical peel treatments (Sales) would have lower readability, quality of information, and technical features compared with resources that did not offer chemical peel treatments (Scholarly).

METHODS

The term “chemical peels” was inputted to the Google (Mountain View, CA) search engine to generate relevant online health resource material. All account preferences

and location settings were turned off prior to the search. Online health resources were screened with an exclusion criterion (repeated results, videos, and purely commercial websites with no description of chemical peels) until 50 resources passed the screening process for further analysis. Advertised resources were also included if they passed the exclusion criteria. A total of 60 resources were screened with 10 resources excluded (1 repeated result, 4 videos, and 5 websites that provided no relevant information to patients), and the 50 resources that passed screening were classified and used for analysis (Figure 1).

These categorized websites were further grouped into either “Sales” or “Scholarly” groups (Table 1). The Sales group contained 29 websites where a patient could eventually purchase and receive a chemical peel. The Scholarly group consisted of 21 websites designed solely to educate patients without the ability to sell a chemical peel.

The readability of each resource was analyzed through a readability formula calculator,¹⁰ which calculated the following scores: Flesch Reading Ease, Flesch-Kincaid Grade Level, Gunning Frequency of Gobbledygook formula (FOG Index), Simple Measure of Gobbledygook (SMOG Index), Coleman-Liau Index, and Automated Readability Index (Table 2). The Flesch Reading Ease generates a score from 0 to 100 with a higher number indicating increased ease of reading, while the other formulas calculate an approximate reading grade level. For example, a FOG Index score of 5 would indicate that the material is written at a fifth grade reading level. Fry readability and Raygor Readability Estimate graphs of all chemical peel resources were generated using the software Readability Studio (Oleander Software, Vandalia, OH).

The DISCERN criteria is a validated tool for evaluating information regarding medical treatment options and has been utilized for similar studies.^{11,12} There are 16 questions focusing on reliability, specific treatment information, and the overall quality rating.¹³ The scoring ranges from 1 to 5 with a score of 1 signifying no criteria is met and 5 indicating all criteria are met. The total DISCERN score is the sum of all 16 individual scores for a total maximum of 80. The Health on the Net code (HONcode) originated in 1995 and is considered the most valued quality symbol of online medical information.¹⁴ The HONcode certification consists of 8 criteria (authority, complementarity, confidentiality, attribution, justifiability, transparency, financial disclosure, and advertising) graded on a scale of 0–2 with “0” indicating not met at all and “2” indicating conditions are fully met. The total HONcode score is a measure of the quality and integrity of the provided medical information and is the sum of all 8 individual scores for a maximum score of 16.¹⁵

The technical quality of the resources was analyzed with 2 website monitoring tools: WooRank (WR; Bridgeline Digital, Burlington, MA) and Website Grader (WG; HubSpot,

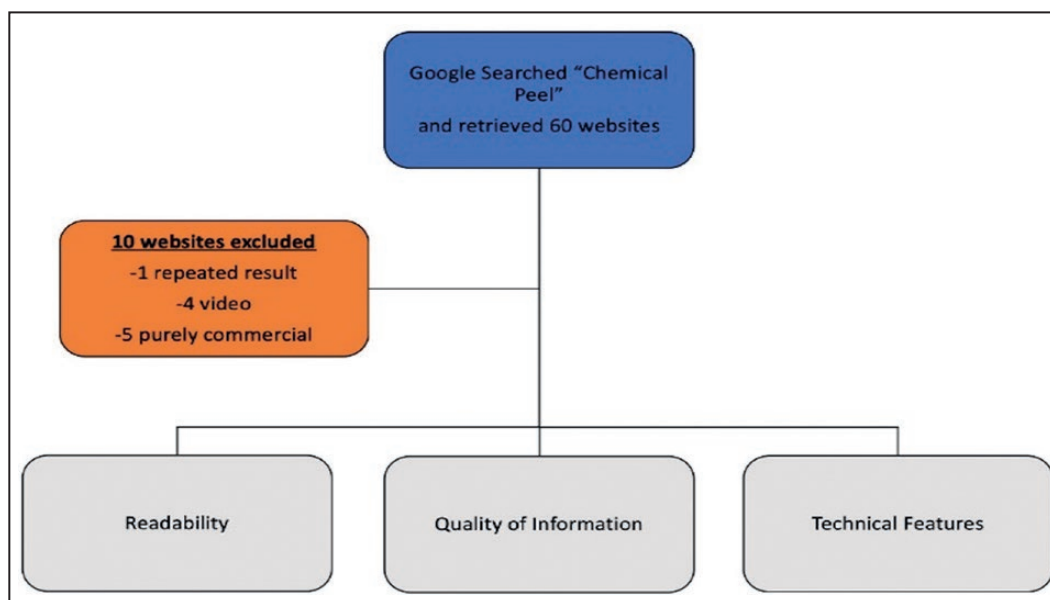


Figure 1. Overview of chemical peel resource collection and analysis process.

Table 1. Classification of Online Chemical Peel Resources

Group	Classification	No. (%) (n = 50)
Sales	Private practice	14 (28)
	Medspa	9 (18)
	Commercial	5 (10)
	Board-certified dentist	1 (2)
Scholarly	Online health resource	8 (16)
	Academic	4 (8)
	Hospital	4 (8)
	Blog	4 (8)
	Reference	1 (2)

Cambridge, MA).¹⁶ The WR score is based on website accessibility, readability, and quality with a score of 0–100. Resources that achieve a WR score of ≥ 70 are considered well optimized, while scores ≤ 40 indicate much work is required to improve its quality.¹⁷ The WG score is based on the resource’s performance, mobility, search engine optimization, and security with the same score range as WR.

DISCERN and HONcode scores were collected by 3 authors (J.A.V., A.P., and C.J.). The mean and standard deviation (SD) of each variable were calculated for both the “Sales” and “Scholarly” groups. A comparison was performed for each variable using a 2-tailed Student’s *t* test with $P < 0.05$ as a threshold for statistical significance.

RESULTS

Private practices managed by board-certified physicians represented the plurality of online health resources (28%), followed by Medspas (18%), and articles (16%) (Table 1). One Sales resource was a board-certified dentist that provided chemical peel treatments. The average reading grade levels of all 50 chemical peel resources were estimated based on 7 readability formulas and ranged from high school junior to university sophomore (Figure 2). The average Flesch Reading Ease score for all chemical peel resources was 50.4, which indicates that the reading level is fairly difficult.¹⁰ The average Fry score value for all resources was 13, ranging from 7 to 17 (Figure 3). Similarly, the average Raygor Readability Estimate was 12, ranging from 6 to 17 (Figure 4). Table 3 outlines the mean quality and technical scores of all online chemical peel resources. The mean (SD) DISCERN and HONcode scores were 46.7 (11.5) and 10.4 (2.8), respectively. In regard to technical features, the WR score was 72.1 (11.3) and the WG score was 68.9 (8.8).

The differences in readability between the Sales and Scholarly resources are displayed in Table 4. The Sales group’s Flesch Reading Ease score of 47.4 (12) was significantly lower than the Scholarly score of 54.4 (12.2), $P = 0.047$, and the Coleman-Liau Index of 11.7 (1.8) was significantly higher than the Scholarly score of 10.6 (1.9), $P = 0.04$. The other readability metrics showed lower readability in the Sales group compared with the Scholarly group, but the differences were not significant (Table 4). The Sales resources had a significantly lower DISCERN

Table 2. Overview of Readability Formulas

Readability Formula	Measured Qualities	Calculation	Output
Flesch Reading Ease	Sentence length, syllables	$206.835 - (1.015 \times ASL) - (84.6 \times ASW)$	0–100 100 = Maximum ease
Gunning Fog	Sentence length, difficult words	$0.4 \times (ASL + PHW)$	Grade level
Flesch-Kincaid Grade Level	Sentence length, syllables	$(0.39 \times ASL) + (11.8 \times ASW) - 15.59$	Grade level
The Coleman-Liau Index	Number of letters, number of sentences	$(0.0588 \times ALW) - (0.296 \times AS) - 15.8$	Grade level
The SMOG Index	Polysyllables	$3 + \sqrt{PSC}$	Grade level
Automated Readability Index	Characters per word, words per sentence	$(4.71 \times ACW) + (0.5 \times AWS) - 21.43$	Grade level
Fry	Sentence length, syllables	Count the number of sentences in three samples of 100 words, and average. Count the number of syllables in three samples of 100 word, and average. Plot on Fry graph	Grade Level
Raygor Readability Estimate	Sentence length, word length	Extract 100-word sample from resource Count number of sentences Count number of words with ≥ 6 letters Plot on Raygor graph	Grade Level

ACW, average characters per word; ALW, average letters per 100 words; AS, average sentences per 100 words; ASL, average sentence length; ASW, average syllables per word; AWS, average words per sentence; G, grade level score; PHW, percentage of difficult words (≥ 3 syllables); PSC, polysyllable count; SMOG, Simple Measure of Gobbledygook.

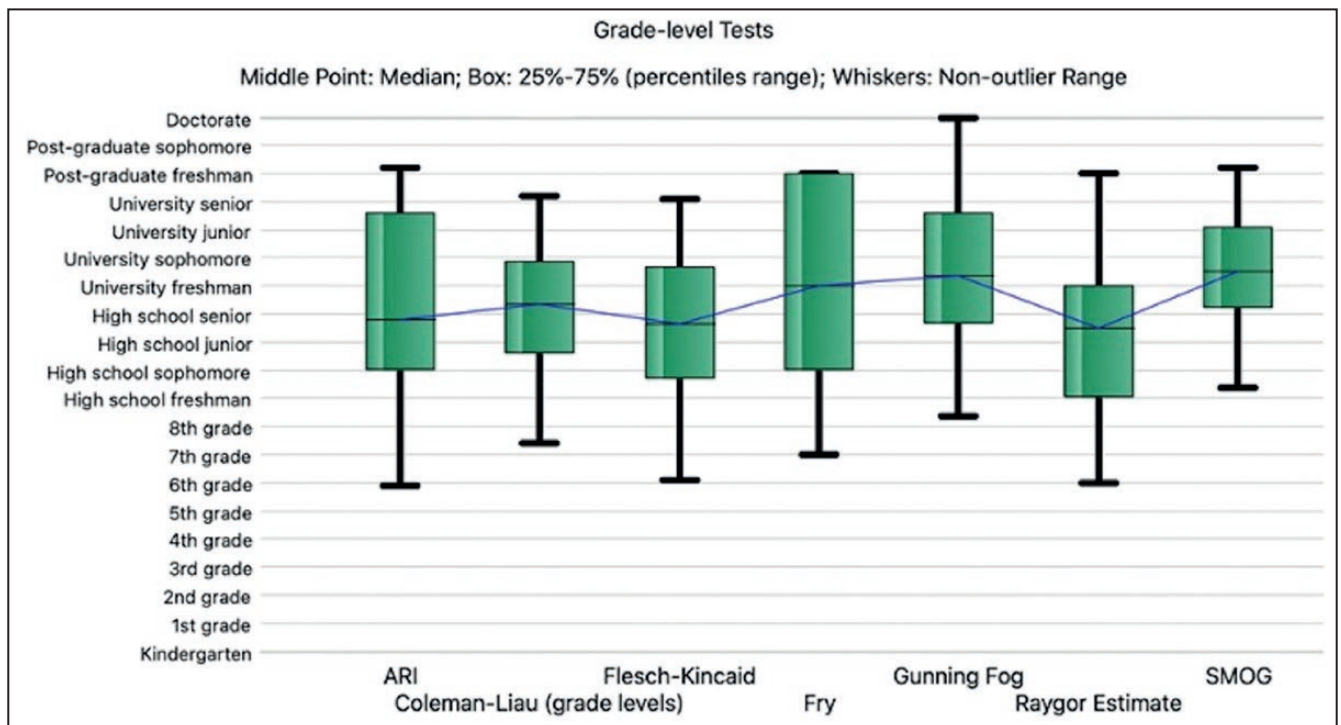


Figure 2. Readability scores of all online chemical peel resources.

Table 3. Quality of Information and Technical Features of All 50 Online Chemical Peel Resources

Variable	Mean (SD)	Maximum Possible Score
DISCERN	46.7 (11.5)	80
HON	10.4 (2.8)	16
WR	72.1 (11.3)	100
WG	68.9 (8.8)	

HON, Health on the Net; SD, standard deviation; WG, Website Grader; WR, WooRank.

Scholarly resources provides the medical community with insight into recognizing differences in website qualities due to their designers' main motivations.

The average readability and quality scores for all 50 chemical peel resources signify that the material can be greatly improved by reducing its complexity and providing better treatment information. The reading grade level for the average online chemical peel resource is much higher than the recommended sixth grade reading level for patients regardless of the specific readability formula used for analysis. The Flesch Reading Ease score of 50.4 was much lower than the 80–90 score range that would classify the material as sixth grade reading level.¹⁰ Numerous studies have reported similar findings of poorer readability scores compared with the recommended grade level for various procedures, including breast reconstruction,¹⁸ neck-lifts,¹² cosmetic botulinum toxin,¹⁹ and rhinoplasty.²⁰ Patients with low health literacy may struggle with evaluating online health information and assessing its validity, so increasing the readability of the material is an opportunity to help mitigate this disparity by reducing this reading barrier.²¹ The benefits of high-quality online resources are severely dampened if patients are unable to comprehend the material, so this must be a priority to the website's authors. This is especially important for safety as the complications of chemical peels such as pain, pruritus, and hypopigmentation should be clearly explained to patients in a straightforward manner.²² The quality of information for the average online chemical peel resource was also subpar as the average DISCERN score of 46.7 was only slightly above half the possible maximum score, and the average HONcode of 10.44 was also below the maximum score of 16. This indicates that the average online chemical peel resource needs to incorporate more aspects of treatment information, such as alternatives, risks, complications, as well as use credible authors and sources. The average WR score of 72.1 indicates that the average online chemical peel resource is well optimized for increased visibility to interested patients. The average WG score of all 50 online

Table 4. Comparative Analysis of Readability Among Sales and Scholarly Resources

Variable	Sales	Scholarly	P-Value
Flesch Reading Ease	47.4 (12)	54.4 (12.2)	0.047*
Automated Readability Index	12.4 (3.8)	10.4 (2.9)	0.06
The Coleman-Liau Index	11.7 (1.8)	10.6 (1.9)	0.04*
Flesch-Kincaid Grade Level	11.7 (3)	10.3 (2.4)	0.07
Fry	14 (3.5)	12 (2.8)	0.14
FOG Index	14.4 (3)	13.4 (2.7)	0.24
Raygor Estimate	12 (3.7)	11 (3.2)	0.56
The SMOG Index	10.9 (2.3)	9.83 (2)	0.09

FOG Index, Gunning Frequency of Gobbledygook formula; SMOG, Simple Measure of Gobbledygook.

*indicates statistically significant values, $P < 0.05$.

Table 5. Comparative Analysis of Quality of Information and Technical Features Among Sales and Scholarly Resources

Variable	Sales	Scholarly	P-Value
DISCERN	39.7 (6.6)	56.4 (9.8)	<0.001*
HON	9.5 (2.3)	11.8 (2.9)	0.0032*
WR	68.6 (11.7)	76.9 (8.9)	0.0082*
WG	67.1 (8.6)	71.3 (8.7)	0.10

HON, Health on the Net; WG, Website Grader; WR, WooRank.

*indicates statistically significant values, $P < 0.05$.

chemical peel resources is 68.9, which is higher than the global average of 60.9.²³ This qualifies chemical peel websites as above average in marketing effectiveness, but resource creators should work on improving qualities such as page loading time, responsiveness, and security to develop its technical features even further and provide patients with a consolidated site for information access.²⁴

Consistent with our hypothesis, all readability formula results indicated that Sales resources had a lower readability than Scholarly resources. Of note, the Flesch Reading Ease score and The Coleman-Liau Index showed that the Sales resources were significantly more difficult to read than the Scholarly resources. Sales resources' usage of longer words and sentences in their material decreased their Flesch Reading Ease score compared with the Scholarly group. The Scholarly resources achieved a better Coleman-Liau Index through writing in shorter sentences and using less difficult words while describing chemical peels. This difference may be explained by examining the purpose of each resource. As a Scholarly resource, the

purpose is to educate patients to make an informed decision so writing at a comprehensible level could be more important to the contributing authors. In contrast, a Sales resource's main focus is displaying the benefits of chemical peels for future purchase so readability might not be the authors' chief priority. Surprisingly, only 5 (10%) chemical peel resources displayed a HONcode certification on their website.

Many Sales resources encouraged potential patients to schedule an appointment for further information. This could explain the lower quality of Sales websites since they may discuss important information regarding chemical peel treatments during these in-person sessions and, therefore, choose not to display all the information online beforehand. As previously mentioned, Sales resources have the goal of selling chemical peel treatments to interested individuals so that they may focus more heavily on the positive aspects of chemical peels and neglect other areas of the DISCERN and HONcode such as possible complications and encouraging shared decision making, which would lead to a lower score. To achieve a higher DISCERN and HONcode score, a resource must provide the complete overview of a medical treatment and this aligns more closely with Scholarly resources' objectives of educating the public.

Sale's resources require major improvement of their technical features to compete functionally with Scholarly resources, with a significant disparity in the WR scores between the 2 groups. Increased advertisements on Sales websites as well as less mobile integration may contribute to the lower technical features, which can negatively impact patient and consumer experience when browsing resources. Readability is a factor in calculating the WR score, so the superior readability scores of Scholarly resources are an additional factor for their higher technical features. Many of the patients admit that before meeting with a plastic surgeon, their primary source of information comes from internet searches.²⁵ For this reason, medical professionals should put additional emphasis on improving the technical features of their online health resources as it is crucial to increasing the accessibility of the information. Improving technical features will also allow medical providers to network with more patients through appropriate utilization of social media, which is inherently connected to online health resources. Plastic surgeons are recommended to use social media to educate the public and improve their reputation within the community, thus increasing their resource's online popularity.²⁶ By increasing these technical features, high-quality online chemical peel resources can distinguish themselves from their counterparts and be more easily accessed by interested patients and consumers. These overlooked technical features are another

opportunity to increase the accessibility of high-quality information for patients.

A potential limitation to the study is the evaluation of the DISCERN and HONcode criteria for each online resource as these tools are both subjective evaluations. To reduce this possible area of bias, 3 authors independently graded each website utilizing these tools and the average of their scores was used for analysis. We recognize that only utilizing Google to perform the search may produce different results from using a different online search engine, but, based on its popularity and high usage worldwide, it seemed to be the most practical modality for acquiring the online chemical peel resources. This study only included resources in a written format to maintain consistency with comparing information, so other avenues of information distribution such as videos or graphics on chemical peel treatments were excluded from the analysis. The results of this novel analysis of online chemical peel resources in context with the findings of the previously mentioned studies that examined similar parameters for various medical procedures indicate that difficulties with readability are a widespread issue that needs to be addressed appropriately as patients increase reliance on acquiring information through these resources.

CONCLUSIONS

Online chemical peel resources are an excellent way to disperse medical information to the public and provide patients with valuable tools to better dictate their medical decisions. However, the quality of these resources must be held to a high standard and be easily accessible for patients and consumers. The average readability of chemical peel resources is too challenging for prospective patients and consumers. Unless the readability is at a more appropriate level, medical practitioners will not be able to convey information to patients as effectively as possible. Scholarly resources had better readability, quality, and technical feature scores than Sales resources, indicating that the former is a more reliable asset to educate patients on chemical peel treatments. Individuals must be able to trust that the information they receive from resources is valid and credible enough for them to make well-informed medical decisions. The results of this study must be interpreted in the context of its cross-sectional nature as online health resources and search engines are constantly changing. As greater emphasis is placed on the internet as a tool for learning about medical treatments and procedures, high-quality health resources are essential to maintain high standards of care for all patients.

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