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Quality and Readability of Online Skin Cancer Patient Education Materials: A Cross-Sectional Study

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Abstract

Background

Online patient education materials are widely used by patients seeking information on dermatologic conditions; however, concerns remain regarding both the quality and readability of these resources.

Objective

This study evaluated the quality and readability of publicly available dermatology websites related to melanoma, basal cell carcinoma (BCC), and squamous cell carcinoma (SCC), and examined the relationship between these domains.

Methods

A cross-sectional analysis of 19 websites was conducted. Website quality was assessed using the DISCERN instrument, while readability was evaluated using the SMOG index, with additional readability metrics collected for descriptive analysis. Spearman's rank correlation was used to assess the association between quality and readability, and websites were categorized by readability (SMOG ≤ 8 vs. > 8) to compare DISCERN scores using the Wilcoxon rank-sum test.

Results

The mean DISCERN score was 50.0 ± 13.32, indicating moderate quality. The mean SMOG score was 7.79 ± 1.42, with a median of 8.16. No significant correlation was observed between DISCERN and SMOG scores ($\rho = -0.057$, $p = 0.817$). DISCERN scores were similar between websites meeting recommended readability levels and those exceeding them (50.1 ± 13.9 vs. 49.9 ± 13.6; $p = 1.00$).

Conclusion

Dermatology patient education materials demonstrate moderate quality but frequently approach or exceed recommended readability levels. Importantly, no relationship was observed between quality and readability, suggesting that improving accessibility to patient materials does not inherently compromise informational quality.

Introduction

The internet has become a significant source of health information for patients, with a substantial proportion of individuals relying on online resources to better understand symptoms, diagnoses, and

treatment options.[2] This is especially relevant in the field of dermatology, where conditions such as skin malignancies present with visible manifestations that result in patients seeking further information prior to clinical encounters. Early recognition and management of skin cancer are critical for improving outcomes, further emphasizing the importance of accessible online patient education materials.[3]

Despite the widespread availability of online health information, the quality and accessibility of digital resources remain variable.[4] Many online patient education materials lack key components necessary for informed decision-making, including clear descriptions of treatment options, risks, and uncertainties. The DISCERN instrument is a validated tool developed to assess the quality of written health information, particularly with respect to treatment choices, and has been widely used in evaluating online medical content.[5]

In addition to quality, readability is a critical factor influencing whether patients can effectively understand and use health information. Current guidelines recommend that patient education materials be written at a Grade 6–8 reading level to ensure accessibility to the general population.[6] However, many studies have demonstrated that online health information often surpasses the recommended levels, limiting comprehension and contributing to disparities in health literacy.

Readability is commonly assessed using validated indices that estimate the level of education required to understand written text. The Simple Measure of Gobbledygook (SMOG) is widely used in health research and is considered appropriate for patient education materials, as it estimates reading level based on the frequency of words with several syllables.[7] The Gunning Fog Index similarly estimates reading level by evaluating sentence complexity and word length, while the Flesch-Kincaid Grade Level uses a combination of sentence length and syllable count to approximate educational difficulty.[7] The Automated Readability Index (ARI) provides an additional estimate based on character and word counts, although it may be less accurate for medical terminology due to its reliance on characters.[8] Using multiple readability assessment tools allows for a comprehensive assessment of website complexity and improves overall readability evaluation.

While both quality and readability are essential components of effective patient education, the relationship between these factors remains unclear. High-quality materials may be more comprehensive but also more complex, whereas simpler materials may sacrifice important information for the sake of clarity. Understanding this relationship is especially relevant for educational materials in skin cancer, where patients often self-monitor and seek care from a healthcare professional upon recognizing concerning signs and symptoms.

This study aims to evaluate the relationship between the quality and readability of online patient education materials related to skin cancer.

Methods

Study Design

This study was a cross-sectional analysis of online patient education materials related to common dermatologic malignancies, including melanoma, basal cell carcinoma (BCC), and squamous cell carcinoma (SCC). The objective was to evaluate the quality and readability of publicly available dermatology websites using validated assessment tools.

Website Identification and Selection

Websites were identified using search strategies designed to replicate typical patient behaviour when seeking health information online. This search took place on March 13, 2026, and was conducted using Google, the most frequently utilized online search engine.[9] For each dermatologic condition, relevant search terms were used to identify commonly accessed resources. The first set of publicly accessible results was reviewed, and websites containing patient-directed educational content were included. Duplicate results were removed. Websites were excluded if they were intended primarily for healthcare professionals, consisted predominantly of multimedia without sufficient written content, required subscription or login access, or represented peer-reviewed journal articles.

Data Extraction

For each included website, data were extracted related to both quality and readability. Website content was independently reviewed, and relevant variables were recorded in a structured dataset.

Quality was assessed using the DISCERN instrument, which evaluates the reliability and quality of consumer health information through a series of standardized questions. Total DISCERN scores were calculated for each website, with higher scores indicating higher quality. DISCERN scores were categorized following DISCERN Handbook guidelines (excellent = 63–75; good = 51–62; fair = 39–50; poor = 27–38; very poor = 15–26).[10]

Readability was assessed using the Simple Measure of Gobbledygook (SMOG) index, which estimates the reading grade level required to understand written content.[7] In addition to SMOG, other readability indices, including Gunning Fog, Automated Readability Index (ARI), and Flesch-Kincaid grade level, were collected to provide a broader assessment of readability across multiple validated metrics.

Statistical Analysis

All advanced statistical analyses were conducted using R. Continuous variables were summarized using mean ± standard deviation (SD) and median where appropriate using Microsoft Excel.

Given that DISCERN and readability indices assess different constructs and are measured on different scales, direct comparison of raw scores between instruments was not performed.

The association between website quality and readability was assessed using Spearman's rank correlation coefficient, selected due to the potential non-normal distribution of scores and the ordinal nature of the DISCERN instrument.

To further evaluate the relationship between readability and quality, websites were categorized based on a SMOG cutoff of 8, consistent with recommended patient reading levels. DISCERN scores were compared between groups (SMOG ≤ 8 vs. SMOG > 8) using the Wilcoxon rank-sum test.

A two-sided p-value < 0.05 was considered statistically significant.

Ethics Statement

This study analyzed publicly available online data and did not involve human participants; therefore, ethics approval was not required.

Results

Study Sample and Overall Characteristics

A total of 19 websites met inclusion criteria and were included in the final analysis. These websites represented a range of dermatologic conditions, including melanoma, BCC, SCC, and varied in source and presentation (Supplementary Table 1).

Quality of Dermatology Patient Education Materials

The mean DISCERN score across all included websites was 50.0 ± 13.3, with a median of 55.0. This distribution suggests moderate overall quality of dermatologic patient education materials, with variability observed across websites (Table 1). Individual DISCERN scores ranged widely, indicating heterogeneity in the reliability and comprehensiveness of online resources (Supplementary Table 2).

Table 1
Overall summary of DISCERN and SMOG scores across included dermatology websites.

Variable	Mean ± SD	Median
DISCERN (quality)	**50.0 ± 13.32**	**55.0**
SMOG (readability)	**7.79 ± 1.42**	**8.16**

Values are presented as mean ± standard deviation and median, demonstrating moderate overall quality and readability levels approaching recommended thresholds

Readability of Dermatology Websites

The mean SMOG readability score was 7.79 ± 1.42, with a median of 8.16. While the mean value approached recommended reading levels for patient education materials, the median exceeding a grade level of 8 suggests that a substantial proportion of websites may require reading skills above recommended thresholds. Additional readability indices demonstrated similar trends (See Appendix A). Gunning Fog, Automated Readability Index (ARI), and Flesch-Kincaid grade level all indicated reading levels generally at or above recommended levels, supporting the consistency of findings across multiple validated readability metrics (Supplementary Table 3).

Relationship Between Quality and Readability

There was no significant correlation between DISCERN and SMOG scores (Spearman's $\rho = -0.06$, $p = 0.82$). This indicates that higher-quality websites, as measured by DISCERN, were not associated with either higher or lower readability levels. DISCERN scores were distributed across a wide range of SMOG values without a clear linear trend, further supporting the absence of a meaningful relationship between quality and readability (Fig. 1).

Comparison of Quality by Readability Level

Websites were categorized based on readability using a SMOG cutoff of 8. Of the 19 included websites, 9 met recommended readability levels (SMOG ≤ 8), while 10 exceeded this threshold (SMOG > 8). DISCERN scores were comparable between the two groups (Table 2). Websites meeting recommended readability levels had a mean DISCERN score of 50.1 ± 13.9 (median 56.0), while those exceeding recommended readability levels had a mean score of 49.9 ± 13.6 (median 49.5).

Table 2
Summary of readability metrics across included dermatology websites.

Metric	Mean ± SD	Median
SMOG	**7.79 ± 1.42**	**8.16**
Gunning Fog	**8.72 ± 1.68**	**8.71**
ARI	**11.91 ± 1.92**	**11.44**
Flesch-Kincaid	**58.78 ± 9.43**	**56.95**
All indices demonstrated reading levels generally at or above recommended thresholds for patient education materials.		

There was no statistically significant difference in DISCERN scores between readability groups (Wilcoxon rank-sum test, $W = 45.5$, $p = 1.00$), indicating that readability level did not significantly influence the quality of dermatologic patient education materials in this sample (Table 3).

Table 3
Comparison of DISCERN scores between websites meeting recommended readability levels (SMOG ≤ 8) and those exceeding recommended levels (SMOG > 8).

Readability Group	n	Mean ± SD	Median
SMOG ≤ 8	**9**	**50.1 ± 13.9**	**56.0**
SMOG > 8	**10**	**49.9 ± 13.6**	**49.5**
No statistically significant difference was observed (Wilcoxon rank-sum test, p = 1.00).			

Subgroup Analysis by Dermatologic Condition

Subgroup analyses were performed based on dermatologic condition, including melanoma, BCC, and SCC. Across conditions, both DISCERN and SMOG scores demonstrated variability; however, no consistent pattern was observed to suggest meaningful differences in either quality or readability between conditions.

Readability levels across all conditions generally remained at or above recommended thresholds, and variability in DISCERN scores was observed within each subgroup. These findings suggest that both quality and readability challenges are consistent across dermatologic conditions rather than being condition specific.

Discussion

This study evaluated the quality and readability of online dermatology patient education materials and found no significant relationship between these domains. Specifically, DISCERN scores were not associated with SMOG readability levels, and websites meeting recommended reading thresholds did not demonstrate lower quality compared to those exceeding them. These findings suggest that quality and readability are independent constructs, challenging the assumption that simplifying medical information may compromise accuracy or reliability. In the context of dermatologic patient education, this highlights an important opportunity to improve accessibility without compromising content quality.

Although overall quality was moderate, readability remains a key concern. While the mean SMOG score approached recommended levels, the median value and supporting readability indices indicate that many websites still exceed the ideal reading grade for patient comprehension. This pattern was consistent across multiple readability measures, reinforcing concerns regarding accessibility of online information for skin cancers.

The absence of a trade-off between quality and readability is particularly important. Efforts to improve readability are unlikely to negatively impact the quality of information, suggesting that both domains can be optimized simultaneously. This has important implications for patient-centered care, as improved readability may enhance patient understanding, facilitate shared decision-making, and improve adherence to treatment recommendations.

Subgroup analyses demonstrated that these patterns were consistent across educational materials for skin cancers, including melanoma, BCC, and SCC. This suggests that the observed limitations in readability and variability in quality are systemic rather than condition-specific, reflecting broader challenges in the development of online patient education materials.

These findings highlight the need for healthcare providers to be aware of the limitations of commonly accessed online resources. Patients may encounter materials that are moderately reliable but not optimally accessible, potentially limiting comprehension. There is a clear opportunity for clinicians and institutions to develop high-quality, patient-centered educational resources that align with recommended readability standards.

Our findings also align with a growing body of literature demonstrating that online dermatologic patient education materials frequently exceed recommended readability levels. Recent evaluations of resources for conditions such as androgenetic alopecia and alopecia areata have reported average reading levels approaching Grade 11, substantially higher than the recommended Grade 6–8 threshold.[11,12] Consistent with these studies, our results suggest that accessibility remains a pervasive limitation across dermatologic conditions, even when informational quality is moderate.

Strengths and Limitations

This study has several strengths, including the use of validated tools to assess both quality and readability, as well as the inclusion of multiple readability indices to ensure consistency of findings. Additionally, the analysis reflects real-world patient search behavior, enhancing the relevance of results.

However, several limitations should be considered. The sample size was relatively small, which may limit statistical power and the ability to detect subtle differences. The cross-sectional design provides a snapshot of available resources at a single time point and may not reflect changes over time. Additionally, while multiple readability indices were included, these tools may not fully capture all aspects of patient comprehension, such as visual design or contextual understanding.

Conclusion

Online dermatology patient education materials demonstrate moderate quality but frequently exceed recommended readability levels. Importantly, no relationship was observed between quality and readability, indicating that improving accessibility does not inherently compromise informational quality. These findings highlight an opportunity to enhance patient education by developing resources that are both high-quality and accessible.

Abbreviations

and acronyms
ARI

Automated Readability Index
BCC
Basal cell carcinoma
SCC
Squamous cell carcinoma
SMOG
Simple Measure of Gobbledygook

Declarations

Declaration of Conflicting Interests

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Author Contribution

L.C. conceived and designed the study, collected and analyzed the data, and wrote the main manuscript text. M.P. contributed to study design, data interpretation, and manuscript revision. I.M. supervised the project and critically reviewed the manuscript. All authors reviewed and approved the final manuscript.

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None

Data availability:

All data is made available in Supplementary Materials.

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Figures

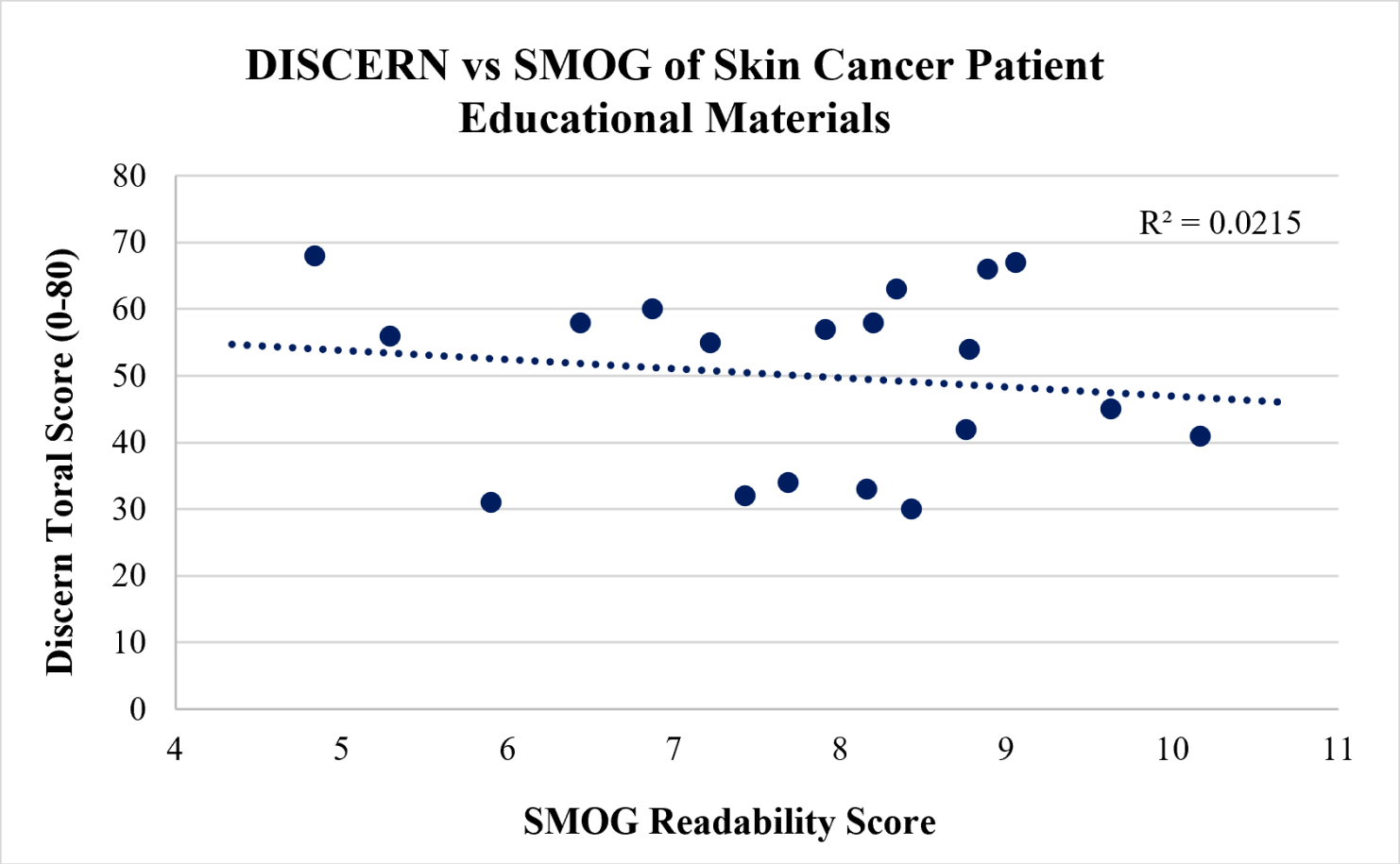


Figure 1

Relationship between readability and quality of online patient education materials for skin cancer.

Each point represents an individual website (n = 19). Readability was assessed using the SMOG index (x-axis), and quality was evaluated using DISCERN scores (y-axis). The dashed line represents the line of best fit, demonstrating no meaningful correlation between readability and quality ($R^2 = 0.0215$).

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryTable1Characteristics.docx
- SupplementaryTable2DISCERN.docx
- SupplementaryTable3Readability.docx
- Appendix.docx