Rhinology Online

ORIGINAL CONTRIBUTION

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The readability and reliability of Greek web-based information on rhinoplasty*

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Abstract

Background: A constantly increasing number of patients seek for Internet sources on diseases or surgical operations before consulting with a medical specialist. Popular among surgical procedures is rhinoplasty. Depending on the quality of information, patient decision making, expectations and satisfaction may be affected in a positive or negative manner. The aim of this study is to objectively assess the readability and reliability of Internet health information in the Greek language on rhinoplasty.

Materials and Methods: We performed a search in the Google engine using a combination of Greek language terms relating to rhinoplasty. After collation and rejection of duplicate, irrelevant or invalid links, the first twenty highest ranking Greek Web sites were analyzed using the on-line Greek Language Centre Literacy Level calculator, the on-line Greek text readability calculator, and the DISCERN publication quality assessment instrument.

Results: From the twenty Web sites, 40% required very good and 35% required excellent Greek Language Literacy Level for comprehension. Content reading was considered quite difficult in 15%, difficult in 60% and very difficult in 25% of the Web sites. The quality of the Web sites appraised by the DISCERN instrument was low to medium. No correlation was found between Google site rank and DISCERN total score.

Conclusions: In general, the reliability of Internet health information in the Greek language on rhinoplasty is mediocre at best and the readability of the respective texts is lower than recommended. Patients should be cautious and always consult one or more medical specialists before reaching a final decision. Evaluation and accreditation of Internet health information sites would greatly assist on sound patient decision-making and satisfaction.

Key words: rhinoplasty, nose job, nose plastic surgery, health information, Internet, World Wide Web

Introduction

In recent decades, Internet access world-wide has increased dramatically and the continuously expanding volume of Internet health-related materials has become a prominent source of information[1,2]. This phenomenon may have beneficial or detrimental effects on health consumers[3-8] and the readability and reliability of such sources have emerged as central issues in patient education[9]. Many tools have been developed for the objective assessment of the quality of this information[10–12] and multiple tests are available for the objective assessment of the readability of texts of any content[13–16]. The ever expanding volume of Internet information is indexed by specialized search engines[17–19]. Web site ranking algorithms[20] and behavioral traits of information seekers[21] introduce major concerns on the way Internet health-related materials are made available to the patients.

Rhinoplasty is one of the most popular cosmetic procedures in the USA[22] and in Greece. The aim of this study is to objectively assess the readability and reliability of Web-based health information in the Greek language on rhinoplasty. The results

may provide an insight on the quality of information available to the public and promote an active appraisal of such Web-based Internet sources. To our knowledge, this is the first domestic study aiming to assess the quality of Internet health information in the Greek language on rhinoplasty.

Materials and methods

Data collection

In July 2020, we performed a Google search for the following Greek language keywords: "ρινοπλαστική" (rinoplastikí / rhinoplasty), "πλαστική ρινός" (plastikí rinós / nose plastic surgery) and "πλαστική μύτης" (plastikí mítis / nose plastic surgery). Each term was entered consecutively using default settings on the Firefox v78.0.1[23] Web browser software. After exclusion of duplicate or invalid links, forum or news groups, advertisements, social media pages, journal articles and video- or audio-only links, we selected the first 20 pertinent individual sites for each keyword search. For each of the three searches, the Web sites received a rank score (20: highest/first, 1: lowest/last). The collation of the combined search results produced 27 individual sites. The cumulative rank score was calculated for each one of them and the 20 highest ranking were selected for further analysis.
The pure body text of each Web site was extracted, removing any programming or formatting computer code (e.g. HTML), advertisements, links or other irrelevant content. The LibreOffice Writer v6.4.5[24] with Greek language support word processor software was used for hyphenation removal and grammar checking.

Greek Language Literacy Level

The Centre for the Greek Language[25] provides a free on-line readability and literacy level calculator. The definitions of Greek Language Literacy Levels are shown in Table 1. Level A1 is suitable for children 8-12 years old, while level Γ2 requires excellent language knowledge ("mastery")[26]. The cleaned-up body text of each Web site was entered and the corresponding literacy level required to comprehend it was calculated.

The Flesch-Kincaid index

The free on-line Greek text readability tool[27] was used to calculate the Flesch-Kincaid index (FKI) adapted for the Greek language by entering the cleaned-up body text of each Web site. The index score ranges and the corresponding reading ease are shown in Table 2. Scores ranging from 90 to 100 are suitable for 11-year-old students, while texts with scores under 30 are best understood by university graduates[28].

The DISCERN instrument

The DISCERN instrument[10] was used to evaluate the quality of information of each of the twenty Web sites. It is a 15-item questionnaire with a 5-point scale (1: No, 2: Mostly No, 3: Partially, 4: Mostly Yes, 5: Yes) and total score range from 15 to 75. Questions 1 to 8 aim to appraise the reliability of the publication (minimum/maximum sub-score: 8/40), while questions 9 to 15 evaluate the completeness of treatment choices described or offered (minimum/maximum sub-score: 7/35). Item 16 is used to rate the overall quality of the publication, based on the answers to questions 1-15 (1: Low, 2: Mostly Low, 3: Moderate, 4: Mostly High, 5: High).
The twenty Web sites were independently reviewed and evaluated by two ENT Consultants (DK and MD). Reviewer differences in DISCERN scores were discussed and attempt was made to reach a rating consensus. In cases of disagreement, the pertinent Web sites were referred to the Senior ENT Consultants (AK and EP) for the final evaluation verdict.

Table 1. Greek Language Literacy Levels.

Level	Description
A1	For children 8-12 years old
A2	Basic knowledge
B1	Moderate knowledge
B2	Good knowledge
Γ1	Very good knowledge
Γ2	Excellent knowledge

Table 2. Flesch-Kincaid index and reading ease.

Flesch-Kincaid index score	Reading ease
100-90	Very easy
90-80	Easy
80-70	Quite easy
70-60	Moderate
60-50	Quite difficult
50-30	Difficult
30-0	Very difficult

Statistical analysis

Statistical analyses were performed using the JASP v0.13[29] open-source statistics software. Frequencies, ranges, means, population standard deviations (PSTDEV) and 95% confidence intervals (CI) were calculated. Spearman's rank correlation coefficient was also calculated. Statistical significance was regarded for p-value ≤ 0.05. The LibreOffice Calc v6.4.5[24] spreadsheet software was used for graph and chart creation.

Results

Greek Language Literacy Level

None of the Web sites was suitable for children 8-12 years old,

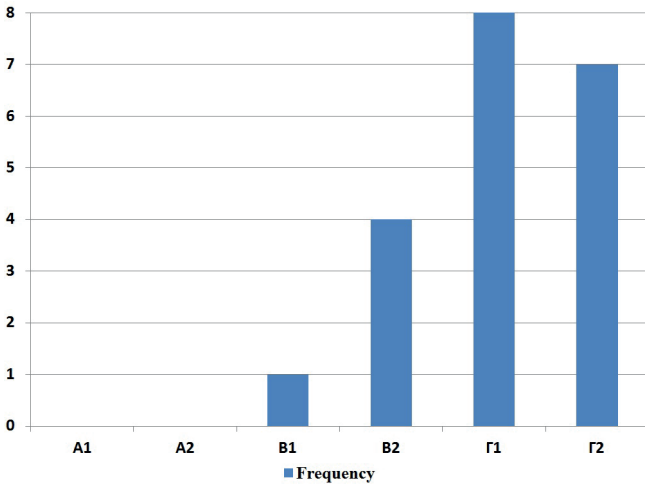

Figure 1. Greek Language Literacy Level frequency column chart.

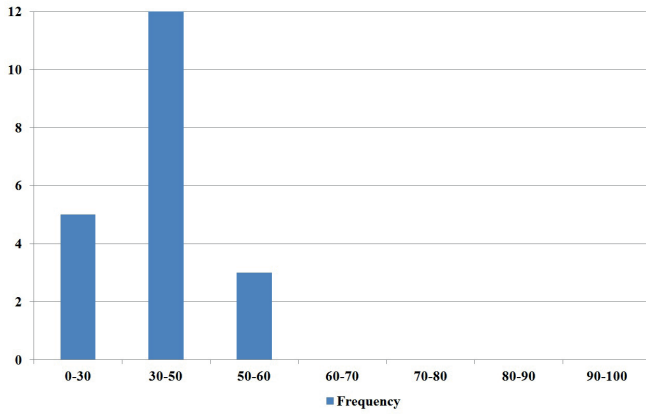

Figure 2. Flesch-Kincaid reading ease level frequencies.

only one (5%) required moderate knowledge and four (20%) required good knowledge of the Greek language. Most of the sites required very good (n=8, 40%) or excellent (n=7, 35%) literacy level for comprehension. Figure 1 summarizes these findings.

Flesch-Kincaid index and reading ease

The FKI for all Web sites ranged from 16.81 to 56.57 (mean=36.50, 95% CI=4.60) and PSTDEV was 10.50. None of the Web sites had the recommended (FKI=90-100) readability level and all of them were considered quite difficult (n=3, 15%), difficult (n=12, 60%) or very difficult (n=5, 25%) to comprehend. Figure 2 summarizes the findings for the FKI reading ease levels.

Reliability assessment with the DISCERN instrument

The DISCERN scores for all Web sites were low to medium, ranged from 25 to 49 (mean=35.10, 95% CI=2.49) and PSTDEV was 5.67. The reliability sub-scores were also mediocre at best, ranging from 14 to 27 (mean=18.80, 95% CI=1.53) with PSTDEV=3.49. Also, the treatment options sub-scores were sub-par, ranging from 10 to 22 (mean=16.30, 95% CI=1.14) with PSTDEV=2.61. The overall quality scores of the Web sites were low to medium, ranged from 2 to 3 (mean=2.55, 95% CI=0.22) with PSTDEV=0.50. Table 3 summarizes the descriptive statistics for all the DISCERN questions. DISCERN total scores and sub-scores for each Web site are shown in Figure 3.

Table 3. DISCERN questions descriptive statistics summary.

DISCERN	Range	Mean	95% CI	PSTDEV
Aim clarity	3-5	3.95	0.17	0.38
Aim achievement	2-5	3.60	0.29	0.66
Relevance	2-4	3.60	0.26	0.58
Information sources clarity	1-3	1.40	0.29	0.66
Information sources date	1-4	1.75	0.44	0.99
Balance and bias	1-3	1.40	0.29	0.66
Additional sources	1-3	1.35	0.25	0.57
Areas of uncertainty	1-3	1.75	0.34	0.77
Reliability sub-scores	14-27	18.80	1.53	3.49
Treatments description	2-4	3.60	0.29	0.66
Treatments benefits	1-4	3.40	0.32	0.73
Treatments risks	1-4	2.30	0.39	0.90
Effects of no treatment	1-3	1.35	0.25	0.57
Treatments and quality of life	1-4	2.75	0.36	0.83
Treatment options clarity	1-3	1.60	0.29	0.66
Shared decision-making	1-3	1.30	0.24	0.56
Treatment options sub-scores	10-22	16.30	1.14	2.61
Total reliability scores	25-49	35.10	2.49	5.67
Overall quality scores	2-3	2.55	0.22	0.50

Correlation statistics

No correlation was found between Google site rank and Greek Language Literacy Level (Spearman's ρ=0.250, P=0.288). Site rank was also not associated with the Flesch-Kincaid index (Spearman's ρ=-0.027, P=0.911) or the Flesch-Kincaid reading ease level (Spearman's ρ=-0.011, P=0.963). Also, no correlation was found between Google site rank and DISCERN publication reliability (Spearman's ρ=0.173, P=0.466), treatment options (Spearman's ρ=0.028, P=0.906), total (Spearman's ρ=0.138, P=0.560) or overall quality (Spearman's ρ=-0.096, P=0.688) scores.

Additionally, Greek Language Literacy Level showed no association with DISCERN publication total (Spearman's ρ=0.328, P=0.158) or overall quality (Spearman's ρ=0.083, P=0.727) scores. Furthermore, no correlation was found between the Flesch-Kincaid reading ease level and DISCERN publication total (Spearman's ρ=0.135, P=0.570) or overall quality (Spearman's ρ=0.308, P=0.186) scores. Notably, a strong correlation was found between the DISCERN reliability and treatment options

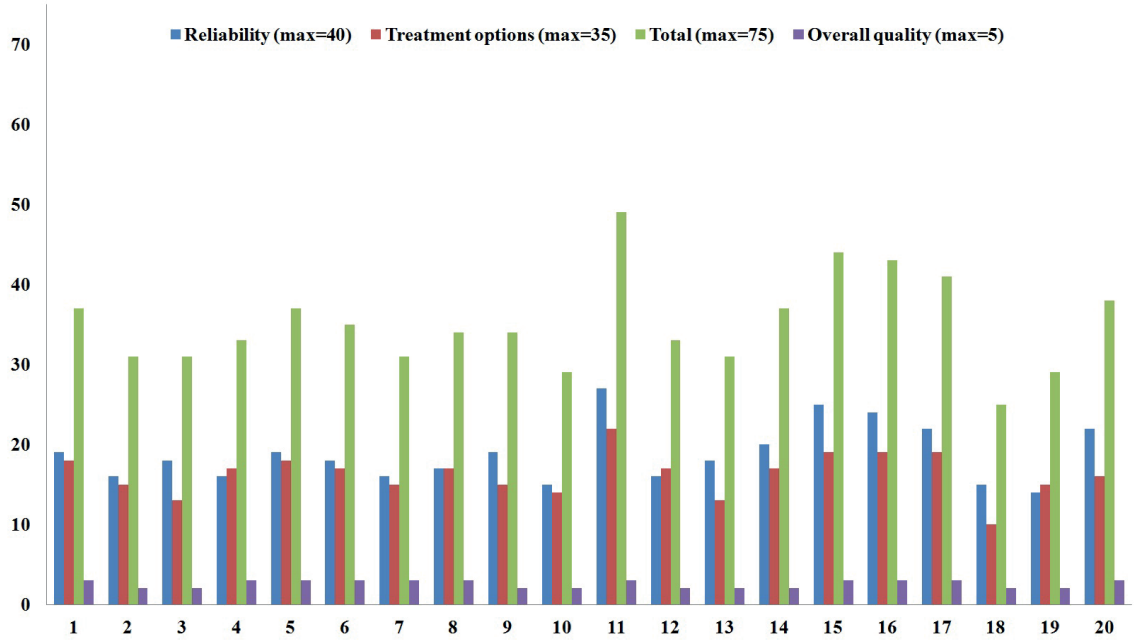

Figure 3. DISCERN total scores and sub-scores per Web site.

Table 4. Correlation statistics summary.

		Spearman's ρ	P
Google site rank	Greek Language Literacy Level	0.250	0.288
	Flesch-Kincaid index	-0.027	0.911
	Flesch Kincaid reading ease	-0.011	0.963
	DISCERN reliability score	0.173	0.466
	DISCERN treatment options score	0.028	0.906
	DISCERN total score	0.138	0.560
	DISCERN overall quality score	-0.096	0.688
Greek Language Literacy Level	DISCERN total score	0.328	0.158
	DISCERN overall quality score	0.083	0.727
Flesch-Kincaid reading ease	DISCERN total score	0.135	0.570
	DISCERN overall quality score	0.308	0.186
DISCERN reliability score	DISCERN treatment options score	0.710	< .001

scores (Spearman's ρ=0.710, P<0.001).
Correlation statistics are summarized in Table 4.

Purpose, specialty initiatives, information providers and Web site design

Eighty percent (n=16) of the twenty collated Web sites were focused on health service advertisements, while only 20% (n=4) aimed for pure patient education. The initiative to provide this information was mainly from Plastic Surgeons (65%, n=13), followed by Otorhinolaryngologists (30%, n=6). Also, the vast majority (80%, n=16) of the information providers were Private Practice Medical Centers or Doctors, occupying the first 14 highest ranking positions. Table 5 summarizes these findings. While we had no means to objectively evaluate the functionality and aesthetics of the collated Greek Web sites, most of them appeared well designed and easily navigated, with plenty of pictures and patient photos. Figure 4 assembles the home pages of the four highest ranking Web Sites.

Discussion

In recent decades, the evolution of computer hardware and the continuous development of software have provided free availability and ease of access to all kinds of information. This phenomenon is greatly pronounced on the volume of Internet health-related materials, which have become a prominent source of health information[1,2], to the extent that Broadband Internet Access has become a social determinant of health[30]. On the other hand, socio-demographic factors may pose access barriers to such sources for certain populations (the "digital divide")[31,32]. Removal of these barriers to strictly medical knowledge has redefined medical practice and many aspects of the classic doctor-patient relationship[33–35]. Also, Health Information Portals have increased their content and service functions[36]. The evolution of mobile technologies now offers ease of access to such sources and utilities not available previously[37,38]. Additionally, the number of Internet health information seekers continually increases over time, as it has been reported by numerous

Table 5. Purpose, specialty initiatives and information providers.

Rank	Purpose	Specialty	Provider
1	Service Advertisement	ENT	Private Practice ENT Surgeon
2	Service Advertisement	Plastic Surgery	Private Medical Center
3	Service Advertisement	Plastic Surgery	Private Practice Plastic Surgeon
4	Service Advertisement	ENT	Private Practice ENT Surgeon
5	Service Advertisement	Plastic Surgery	Private Practice Plastic Surgeon
6	Service Advertisement	Plastic Surgery	Private Medical Center
7	Service Advertisement	Plastic Surgery	Private Practice Plastic Surgeon
8	Service Advertisement	ENT	Private Practice ENT Surgeon
9	Service Advertisement	Plastic Surgery	Private Practice Plastic Surgeon
10	Service Advertisement	Plastic Surgery	Private Practice Plastic Surgeon
11	Service Advertisement	ENT	Private Medical Center
12	Service Advertisement	Plastic Surgery	Private Practice Plastic Surgeon
13	Service Advertisement	ENT	Private Medical Center
14	Service Advertisement	Plastic Surgery	Private Practice Plastic Surgeon
15	Patient Education	ENT	Health Information Provider
16	Service Advertisement	Plastic Surgery	Health Information Provider
17	Patient Education	None	On-line Encyclopedia
18	Service Advertisement	Plastic Surgery	Private Practice Plastic Surgeon
19	Patient Education	Plastic Surgery	Health Information Provider
20	Patient Education	Plastic Surgery	Health Information Provider

studies worldwide[39–42]. This trend is especially prevalent among patients interested in aesthetic procedures, including rhinoplasty[43,44]. These developments have introduced new benefits as well as new challenges in the doctor-patient interaction[33–35].
The DISCERN instrument is a popular questionnaire-based validated tool focusing on the overall quality of health-related internet sites[10]. Emerging machine-based learning technologies offer the prospect of automated assessment of Web sites using the DISCERN[11]. The LIDA is another appraisal instrument that allows objective measurements of the accessibility, usability and reliability of Internet health information sites[12]. Health-related educational materials available to the public should be of high quality. High reliability of such information has been shown to be beneficial to patients and information seekers, while intentional or unintentional quality compromises have detrimental effects[45]. Understanding the quality of Internet health information in the digital era is of paramount importance[46].
Guiraud's R index is a measure of lexical diversity and richness[13]. Reading ease can be evaluated based on the scores of such measures as the Flesch-Kincaid[14] and the Gunning Fog indices[15]. In the USA, the recommended readability level of patient health information and educational materials should be suitable for 11-13 years old children[16] and equally profit subjects with different eHealth literacy levels[47]. In Greece, on the other hand, there are no official recommendations for such materials. Comprehension challenges may negatively affect patient decision-making, participation and satisfaction of treatment[48].
The Web search engines are the most popular method employed for Internet information retrieval. Google is the most popular search engine in Greece, accounting for a market share of about 98%[49]. These software systems use a Web crawler approach[50] to gather results from Internet sources. Complex algorithms are used for Web site ranking, although the visibility of a specific Internet page may be increased ("optimized") by paid placement, irrelevant of its quality or popularity[20]. There is much controversy concerning the site ranking criteria; reliability and relevance are not the sole determinants and the displayed results may be highly biased[51]. One the other hand, while each query may return hundreds to thousands of results, patients tend to visit only the first ten highest ranking Web sites[21]. Under this scope, such a behavioral trait may affect in indeterminate ways patient exposure and interaction with health-related material published in the Web. Therefore, a major concern exists on the way Internet health information is made available to the patients.
Although no pooled data exist in Greece, augmentation rhinoplasty is the most frequently performed aesthetic operation by Otorhinolaryngologists. Another indication for this procedure is nasal valve function restoration, which may improve disease-specific quality of life[52,53]. Rhinoplasty procedures offer a number of alternative actions to both patients and physicians.

Figure 4. Home page assembly of the four highest ranking Greek Web sites on Rhinoplasty.

The doctor-patient interaction very often involves a debate about facial symmetry, surgery perspectives, as well as patient satisfaction[54]. Notably, the high prevalence of body dysmorphic disorder reported in patients seeking rhinoplasty appears to have a negative impact on subjective treatment outcomes[55,56]. Although one of the most challenging procedures in plastic surgery[57], it has a high safety profile and low complication rates[58]. On the other hand, the relatively low satisfaction rates reported may be due to potentially unrealistic patient expectations[59]. This finding underlines the importance of sound patient counseling and high quality health information availability, including Web-based Internet sources.

It has been shown by numerous studies that ample health information availability may offer additional social and emotional support to health consumers[3], better disease prevention and management[4], reduced anxiety[5], and greater self-reliance[6,7]. On the other hand, the uncontrolled and unfiltered publication of such materials may result in patient misinformation or hazards, if unreliable or incorrect[8]. As the Internet has become a prominent source of health information, the readability and reliability of the latter have emerged as central issues in patient education[9]. The quality of online health information has been assessed by a large number of studies[45,60–63]. In general, it is mediocre at best and of low standards. To amend this, independent foundations or other entities provide certification services for medical and health Web sites[64,65]. Numerous studies have assessed the reading ease of publications on ENT health conditions[66–68] and procedures[45,69–71]. In general, the readability

of Internet health information is considered low and does not adhere to literacy level recommendations.

To the authors' knowledge, this is the first domestic study aiming to assess the quality of Greek Web-based health information on rhinoplasty. Our results revealed low readability and low to moderate reliability of the screened Greek Web sites, which is in line with publications in other languages and countries in Europe and across the globe[44,45]. The overall quality of Internet health information in the Greek language is sub-par, which may negatively affect patient decision-making, expectations and satisfaction. Certification of Greek Web sites containing health information and patient educational material remains an unmet need. Limitations of our study include the limited reference time-frame (July 2020), the non-exhaustive search for Internet health information sources (e.g. exclusion of news groups, social media pages or multimedia sites) and the narrow spectrum of the used Google search keywords.

Conclusions

In general, the reliability of Internet health information on rhinoplasty is below average and the readability of the respective texts is lower than recommended. Greek Web sites on rhinoplasty are also of low to moderate quality and require high literacy levels to comprehend. Patients should be cautious and always consult one or more medical specialists before reaching a final decision. Certification of Internet health information sites using objective appraisal tools would greatly assist on sound patient decision-making and satisfaction.

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Authorship contribution

Conceptualization, AK and NC; methodology, DK, NC and MD; software, DK and M-EP; validation, AK and EP; formal analysis, M-EP; data curation, M-EP; writing—original draft preparation, DK; writing—review and editing, AK, MD and EP; supervision, AK All authors have read and agreed to the published version of the manuscript.

Conflict of interest

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Consent for publication

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Availability of data and materials

Not applicable.

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