



Readability and reliability of Rhinology patient information on Google

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Background: Despite near universal internet access in Western societies and frequent patient use for searching health information, very little is known about the information available online for sinusitis and sinus surgery. This study aims to objectively measure the readability and quality of Rhinology information publicly available on Google.

Methods: The first 100 consecutive websites under the search terms sinusitis, chronic rhinosinusitis, endoscopic sinus surgery and FESS were included, generating 400 websites. Websites were classified as: physician/hospital generated, academic, medicolegal, industry or discussion articles. Each website was scored for readability and quality using the Flesch Reading Ease (FRE), Flesch-Kincaid Grade (FKG), Gunning Fog score (GF), DISCERN and Journal of American Medical Association scores (JAMA). Identification of Health on Net Code (HONcode) suggested greater credibility for a website.

Results: In all subgroups, the average reading ease scores equated to a minimum college education reading requirement. Academic websites were significantly more difficult to read compared to physician/hospital generated websites, however the information was found to have greater reliability. The website quality scores were heterogeneous across all of the subgroups. In addition, between five and 48 websites per search term, were found to be irrelevant.

Conclusions: The study confirms the challenges patients face when searching online for medical resources. Once they navigate through the large number of irrelevant websites, they are presented with websites which are difficult to read and low in quality. As clinicians, we should aim to take further responsibility for all our patients and provide suggestions for reliable and trustworthy online Rhinology information.

Keywords: Sinusitis; chronic rhinosinusitis; endoscopic sinus surgery; health resources; patient information

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Introduction

Access to the internet has rapidly increased in recent decades with reach now to almost 60% of the global population (1). In Western societies, this rate is further increased to 90% with access to the internet expected in the general population (1,2). The internet allows near instant access to large quantities of largely unregulated

information. Google is comfortably the most popular search engine, having a 92.6% market share (3,4). Studies have indicated that up to 70% of patients access the internet to read health-related information (5). Different opinions exist among clinicians with one study of internet use amongst a population of General Practice patients concluding that it leads to a better mutual understanding of symptoms and

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diagnosis (6). There is however also a tendency amongst health care professionals to discourage patients from using internet searches to access clinical information (7).

Studies across several specialties have explored the reliability of online resources accessed by patients for their medical conditions and associated treatments (8-12). However, the literature available regarding the quality of online patient health information in Otolaryngology is scarce (13). Sinus conditions affect a large section of the population and are commonly encountered in all levels of health care (14). The body of material available on the internet related to sinusitis and endoscopic sinus surgery has not been well studied.

The usefulness of a health resource to patients depends on both the readability and the reliability. Readability is defined as how easy a text is to understand and reliability is how trustworthy and consistent the information presented is. A number of objective tools and scoring criteria have been developed to measure this. Lack of either factor could compromise the patients understanding and ultimately impact on their health care. We hypothesise that online resources in Rhinology that are available to patients are not appropriately readable and reliable. The aim of the study therefore is to objectively assess the readability and reliability of information relating to sinusitis and endoscopic sinus surgery currently available on Google to the general public.

We present the following article in accordance with the TREND reporting checklist (available at <http://dx.doi.org/10.21037/ajo-21-2>).

Methods

Ethics committee approval was not required for this study.

Internet search (Table S1)

The four search terms: “Sinusitis”, “Chronic rhinosinusitis”, “Endoscopic sinus surgery” and “FESS” were used in the Google search engine. The search was performed through a Google Chrome browser on 03 September 2019 in Hamilton, New Zealand. A Waikato Hospital computer was utilized without logging into a Google account. The first 100 consecutive websites for each search term were recorded, generating a total of 400 websites.

Each website was allocated to one of five general categories: “Hospital” which includes websites generated by public or private hospitals, Ministry of Health, medical

associations or individual physicians. “Academic” which primarily includes journal articles and book chapters. “Medicolegal” encompasses insurance companies for both patients and surgeons. “Industry” includes pharmaceutical and medical device companies. Finally, “Discussion articles” refer to news and magazine articles, blog and social media posts.

The individual websites were then reviewed and scored for readability and reliability by a single author.

Readability

The readability of a website was measured through three objective scoring criteria: the Flesch Reading Ease score (FRE), the Flesch-Kincaid Grade level (FKG) and Gunning Fog score (GF). The FRE was created by Rudolf Flesch who joined with J. Peter Kincaid in 1975 to create the FKG for the US navy. The three scores indicate the level of English education required for comprehension of the text. The FRE ranges from 0 to 100 where 0–30 equates to a College graduate and 90–100 is equivalent to 5th grade. The FKG corresponds directly to the US grade level and a score over 12 indicates college level requirement. GF score predicts the number of years of education needed for comprehension. A score of over 17 equals college level education (Table 1).

Reliability

The credibility and reliability of the websites are scored through the DISCERN score, JAMA score and HONcode. The DISCERN score was created by a team of experts from different areas in health. It consists of 16 questions, each with a possible score between 1 and 5, generating a total score between 16 and 80. The first eight questions focus on the reliability of the text and the second eight questions focus on the treatment (15) (Table 2).

The JAMA benchmark criteria were published in 1997 and assesses website quality through authorship, attribution, disclosure and currency (16). It provides a simple mechanism to quickly review the basic standards expected of a website. Each criterion is scored zero or one with a total score between 0 and 4.

The Health on Net Code is a not-for-profit organization established in 1995 with the aim of filtering the World Wide Web for trustworthy health information online (17). Presence of the code on a website would suggest more reliable health content.

Table 1 Readability criteria

Education level	FRE	FKG	GF	Reading level
5 th grade	100–90	5–6	5–6	Very easy to read
6 th grade	90–80	6–7	6–7	Easy to read
7 th grade	80–70	7–8	7–8	Fairly easy to read
8 th and 9 th grade	70–60	8–10	8–10	Plain English
10 th to 12 th grade	60–50	10–13	10–13	Fairly difficult to read
College	50–30	13+	13–17	Difficult to read
College graduate	30–0	–	17+	Very difficult to read

FRE, Flesch Reading Ease; FKG, Flesch-Kincaid Grade; GF, Gunning Fog score.

Table 2 DISCERN criteria

Question	Criteria
1	Are the aims clear?
2	Does it achieve its aims?
3	Is it relevant?
4	Is it clear what sources of information were used to compile the publication?
5	Is it clear when the information used or reported in the publication was produced?
6	Is it balanced and unbiased?
7	Does it provide details of additional sources of support and information?
8	Does it refer to areas of uncertainty?
9	Does it describe how each treatment works?
10	Does it describe the benefits of each treatment?
11	Does it describe the risks of each treatment?
12	Does it describe what would happen if no treatment is used?
13	Does it describe how the treatment choices affect overall quality of life?
14	Is it clear that there may be more than one possible treatment choice?
15	Does it provide support for shared decision making?
16	Based on the answers to all of the above questions, rate the overall quality of the publications as a source of information about treatment choices

Analysis

Websites were considered irrelevant if the information was inconsistent with the search term or had restricted access. Journal articles were excluded from analysis if the full article was not accessible. The relationship between readability and reliability criteria were also reviewed. Statistical analysis was carried out using the Minitab 18 software. A 5% level of statistical significance was used for all tests with $P < 0.05$.

One way analysis on variance was used to test the equality of the mean scores for the different categories. If the assumptions of the ANOVA test did not hold, the Kruskal-Wallis test was used to the hypothesis that the scores were identical. Two sample t-test was used to test the equality of the means for the first 50 samples *vs.* the rest. The relationships between scores were investigated using two-way plots and regression.

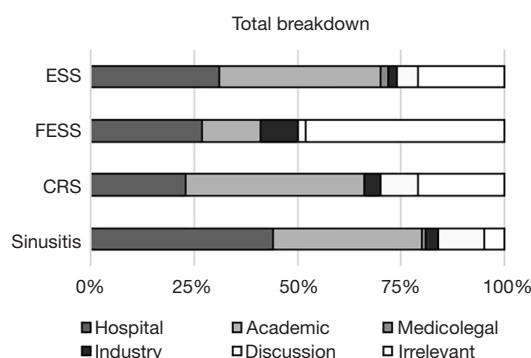


Figure 1 Category of websites for each search term. ESS, endoscopic sinus surgery; FESS, functional endoscopic sinus surgery; CRS, chronic rhinosinusitis.

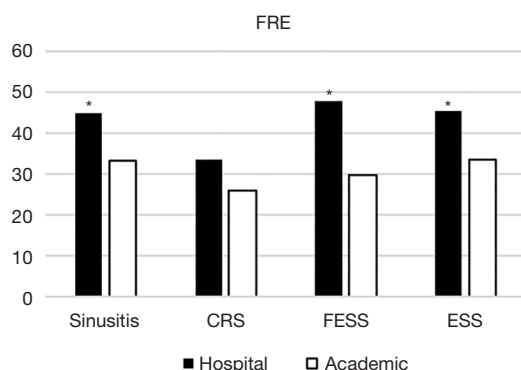


Figure 2 Flesch Reading Ease (FRE) score between hospital and academic websites. *, demonstrates statistical significance ($P < 0.05$). CRS, chronic rhinosinusitis; FESS, functional endoscopic sinus surgery; ESS, endoscopic sinus surgery.

Results

Sinusitis and chronic rhinosinusitis generated over 12 million results each while FESS and endoscopic sinus surgery generated 8.3 and 5.6 million results respectively.

Sinusitis

The hospital and academic categories had the most website numbers with 44 and 36 respectively. The mean FRE score for hospital generated resources was significantly higher (44.9 ± 4.84 vs. 33.2 ± 5.36 , $P < 0.01$). There was no difference detected in FKG and GF readability scores between the two categories (11.6 ± 0.98 vs. 13.2 ± 1.08 , $P = 0.24$ and 13.8 ± 1.00 vs. 15.4 ± 1.11 , $P = 0.35$). Academic resources were found to be more reliable with a significantly greater JAMA score

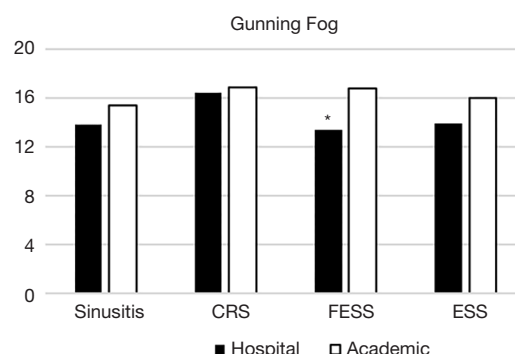


Figure 3 Gunning Fog score between hospital and academic websites. *, demonstrates statistical significance ($P < 0.05$). CRS, chronic rhinosinusitis; FESS, functional endoscopic sinus surgery; ESS, endoscopic sinus surgery.

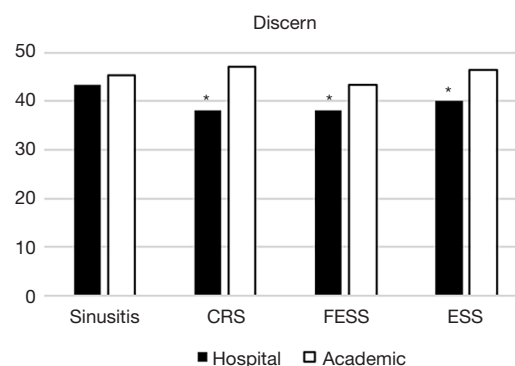


Figure 4 DISCERN score between hospital and academic websites. *, demonstrates statistical significance ($P < 0.05$). CRS, chronic rhinosinusitis; FESS, functional endoscopic sinus surgery; ESS, endoscopic sinus surgery.

(2.9 ± 0.35 vs. 1.5 ± 0.32 , $P < 0.01$) and greater prevalence of HONcode (30.6% vs. 13.6%). No difference in DISCERN score was found between hospital and academic resources ($P = 0.13$). No HONcodes were found in websites of the other categories. Discussion articles had 11 websites and five of the total websites were considered irrelevant (Figures 1-5).

Chronic rhinosinusitis

Twenty-three websites were hospital generated while 43 were academic category and 21 irrelevant. Few websites were categorized as industry or discussion articles (four and nine respectively). The hospital resources had a greater FRE score compared to academic websites, it was however not statistically significant (33.4 ± 6.2 vs. 25.8 ± 4.6). No

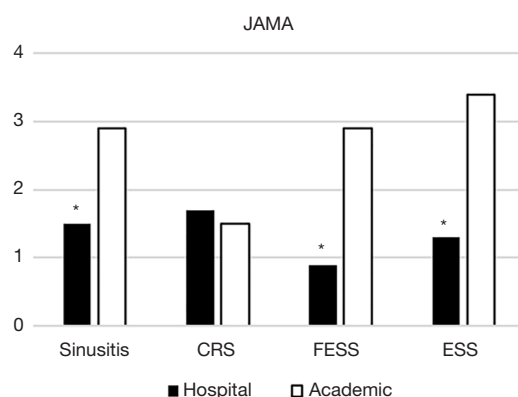


Figure 5 Journal of American Medical Association (JAMA) score between hospital and academic websites. *, demonstrates statistical significance ($P < 0.05$). CRS, chronic rhinosinusitis; FESS, functional endoscopic sinus surgery; ESS, endoscopic sinus surgery.

significant difference in readability was found for FKG and GF (14.2 *vs.* 14.7, 16.4 *vs.* 17.0). The academic resources were more reliable with a significantly higher DISCERN score (47.1 ± 3.3 *vs.* 38.2 ± 4.5 , $P = 0.01$) and greater HONcode prevalence (14% *vs.* 8.7%). The first 50 websites had a significantly higher DISCERN and JAMA score compared to the second 50 for chronic rhinosinusitis (48.2 *vs.* 39.1, $P < 0.001$, 3.2 *vs.* 2.7, $P = 0.04$).

FESS

Forty-eight of the 100 websites were irrelevant to sinus surgery with 27 and 14 each for hospital and academic categories. Hospital resources were significantly easier to read compared to academic resources for all three readability scores (FRE 47.8 ± 4.5 *vs.* 29.7 ± 6.3 , FKG 10.9 ± 1.0 *vs.* 14.2 ± 1.2 , GF 13.4 ± 1.1 *vs.* 16.8 ± 1.4 , $P < 0.01$). While easier to read, the hospital resources were significantly less reliable through both the DISCERN score (38.1 ± 4.3 *vs.* 43.3 ± 5.8 , $P = 0.05$) and JAMA (0.86 ± 0.33 *vs.* 2.90 ± 0.40 , $P < 0.01$) compared to academic websites. Seven-point-one percent of hospital websites had HON code certification. The JAMA score was significantly greater in the first 50 websites at 2.3 compared to 1.7 for the second 50 ($P = 0.02$).

Endoscopic sinus surgery

There were 31 and 39 websites for the hospital and academic categories while 21 were found to be irrelevant.

Readability was significantly different for hospital resources for the FRE score (45.5 ± 5.7 *vs.* 33.4 ± 5.1 , $P = 0.04$) but not significantly different for FKG ($P = 0.11$) and GF ($P = 0.09$). The academic resources were again significantly more reliable for DISCERN (46.4 ± 3.3 *vs.* 40.2 ± 3.5 , $P = 0.03$), JAMA criteria (3.4 ± 0.3 *vs.* 1.3 ± 0.3 , $P < 0.01$) and HONcode (12.5% *vs.* 3.1%).

An analysis of the relationship between the reliability scores (DISCERN and JAMA) and readability scores (FRE and FKG) did not show any significant correlation with maximum R^2 being 12.6%. The search terms sinusitis and chronic rhinosinusitis had 14 overlapping websites while FESS and endoscopic sinus surgery had 12 websites overlapping. The subcategories of medicolegal, industry and discussion articles occurred infrequently and analysis was not included.

Discussion

Vast amounts of health information are available and easily accessible on the internet. Patients are increasingly using this information as an adjunct towards their health care. Rather than a barrier to clinicians, health information “Googled” by patients should ideally be utilized as a resource to complement management. However, in recent years, many specialties including orthopedics, gynaecology and psychiatry have consistently found the available online resources to be presented at a difficult reading level and lacking in quality (8-12).

Doubleday found resources on thyroid treatment to be fair in quality and beyond the reading level of average patients (18). Yi and Hu found similar results for vocal fold injections (19). Interestingly, Shetty analyzed six specific online medical websites for otitis media and found both the readability and reliability to be adequate (20). The readability for patient material in endoscopic sinus surgery was found to be written above the recommended education level (21). With the exception of Cherla’s study, very little is known currently however about the quality of Rhinology information online.

While literacy among the 37 developed high income economy countries of the Organisation for Economic Co-operation and Development (OECD) approaches almost 100%, health literacy levels are far lower (22). The National Assessment of Adult Literacy (NAAL) conducted a large-scale survey within the US in 2003. One-third of the population were found to have basic or below basic health literacy skills. Those who are aged above 65, Black

or Hispanic are at particular risk (23). A Ministry of Health survey found New Zealanders to have a poor health literacy overall (24).

Across all search terms and categories, our data has found college attendance to be the minimum level of education required for comprehension. Information from academic sources for chronic rhinosinusitis and FESS are presented at a college graduate level. The latest Census data from the US found 61% of the population aged over 25 with some college education and only 35% having completed college with a bachelor's degree (25). This portrays a significant disconnect between the online health information and its targeted population. Based on the Census data, with 90% of the adult population, high school level education should be targeted for online resources. In our study, no individual category had a readability of this level.

Reliability of a website contains a number of factors including clear authorship, publication date, references, relevance and accuracy. While no single group of criteria encompasses all the factors, the use of DISCERN, JAMA and HONcode status provide a useful objective tool for comparison. The challenge in online health information is finding the balance between providing information patients can understand and not providing enough information.

Geographic data variation is noted as a limitation of this study. With the search completed in New Zealand, a number of the websites encountered were generated locally. These websites are unlikely to be encountered through similar search terms globally. However, as per the websites listed only 22 out of 400 websites were New Zealand-based and so we consider our results to be broadly representative of search findings worldwide. We found that while the targeted demographic varied depending on the website origin, the mean readability and reliability was not significantly different. We also note the possibility of individual search variation due to the personalised Google search function and development of smart technology. This is however unlikely to impact on the overall quality of the websites. Secondly, the data collection and scoring was completed by a single author. This may contribute to a scoring bias, however the consistency in scoring interpretation was viewed as an advantage and removes potential interpersonal differences.

Summary

Our study recognizes the lack of current online health information in Rhinology with appropriate reading ease

and reliability. Patients need college level education only to encounter poor to fair quality resources. These data challenge Rhinologists to in the short-term consider assisting patients with their online searching and in the longer-term to create online high-quality patient resources with content that is readable and reliable.

There is a further notable challenge. Even if a website fulfills the criteria for readability and reliability, it may not be found amongst the large volume of websites returned by the search terms. As such the provision of high-quality resources may be best in centralised online spaces which are easily found by patients.

Conclusions

Online resources are rapidly developing into a key component of a patient's medical journey. Patients searching for online health information in Rhinology are hindered by the vast number of websites which are irrelevant, difficult to comprehend, inaccurate or unreliable. Clinicians should aim to take additional responsibility by being familiar with relevant and reliable online Rhinology resources so suitable suggestions could be provided to all patients. Clinicians generating future online resources should take note of this to avoid further complicating the patients Google search in an already congested world wide web.

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Footnote

Reporting Checklist: The authors have completed the TREND reporting checklist. Available at <http://dx.doi.org/10.21037/ajo-21-2>

Data Sharing Statement: Available at <http://dx.doi.org/10.21037/ajo-21-2>

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no pecuniary benefit will be obtained. The other authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work (if applied, including full data access, integrity of the data and the accuracy of the data analysis) in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Ethics committee approval was not required for this study.

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Table S1 Websites accessed

Sinusitis

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2. <https://www.healthnavigator.org.nz/health-a-z/s/sinusitis-acute/>
3. <https://www.healthnavigator.org.nz/health-a-z/s/sinusitis-chronic/>
4. <https://www.mayoclinic.org/diseases-conditions/chronic-sinusitis/symptoms-causes/syc-20351661>
5. <https://msdmanuals.com/en-nz/professional/ear,-nose,-and-throat-disorders/nose-and-paranasal-sinus-disorders/sinusitis>
6. <https://www.webmd.com/allergies/sinusitis-and-sinus-infection>
7. <https://en.wikipedia.org/wiki/Sinusitis>
8. <https://www.familyhealthdiary.co.nz/conditions/sinusitis/>
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13. <https://www.medicalnewstoday.com/articles/322932.php>
14. <https://www.healthline.com/health/cold-flu/sinus-infection-symptoms>
15. <https://www.trgimaging.co.nz/about-us/latest-news/sinusitis/>
16. <https://www.stuff.co.nz/life-style/well-good/teach-me/82982445/the-pain-of-a-sinus-infection-and-what-you-can-do-about-it>
17. <http://www.entcolumbia.org/staywell/document.php?id=33652>
18. <https://my.clevelandclinic.org/health/diseases/17701-sinusitis>
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23. <https://acaai.org/allergies/types/sinus-infection>
24. <https://www.nhsinform.scot/illnesses-and-conditions/ears-nose-and-throat/sinusitis>
25. <http://www.allergyclinic.co.nz/seafood-allergy/>
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27. <https://www.ncbi.nlm.nih.gov/books/NBK470383/>
28. <http://www.childrenshospital.org/conditions-and-treatments/conditions/s/sinusitis/symptoms-and-causes>
29. https://www.emedicinehealth.com/sinus_infection/article_em.htm
30. <https://www.sciencedirect.com/topics/medicine-and-dentistry/maxilla-sinusitis>
31. <https://www.cdc.gov/antibiotic-use/community/for-patients/common-illnesses/sinus-infection.html>
32. <https://www.medtronic.com/au-en/your-health/conditions/sinus-infections.html>
33. <https://uptownallergyasthma.com/sinusitis-treatment/>
34. <https://www.healthinfo.org.nz/patientinfo/86153.pdf>
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Table S1 (continued)

Table S1 (continued)

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