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Health on the Net: Do Website Searches Return Reliable Health Information on Hemorrhoids and Their Treatment?

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Objective: To analyze the quality of health information on the Internet on hemorrhoids across 5 Western languages and perform a comparative analysis of website sponsors.

Summary of background data: Hemorrhoids are a common condition affecting the hemorrhoid cushions of the anal canal. Many treatment options are available. Information on the Internet on hemorrhoids is considered variable, but there is little data analysis to support this. The World Health Organization's Health On the Net (HON) accredits medical and health websites based on a code of conduct and publishes a toolbar that aids identification of such accredited websites.

Methods: Using the Google search engine (http://www.google.com, Google, Mountain View, California), searches were performed using 11 keywords related to hemorrhoids in

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English, French, German, Italian, and Spanish. Health On the Net accreditation was determined to assess quality website information. The first 150 websites in each language had their adherence to the HON principles analyzed, and English websites were analyzed to determine sponsorship source.

Results: Of the 8250 websites analysed, 586 (7.1%) were found to HON-accredited. The rate of HON accreditation ranged from 2.0% (piles) to 10.0% (hemorrhoids), with higher-ranking results having higher rates of HON accreditation ($P < 0.001$).

Conclusion: There is a paucity of high-quality information on the Internet; however, the Google search algorithm prioritizes high-quality information in its web search results.

Key words: Hemorrhoids – Internet – Patient education – Google

Patient information is an important component of healthcare, particularly in surgery. In recent years, the Internet has become an accessible, convenient, and trusted source of health information for patient. Over 80% of patients report using the Internet to seek health care associated material.[1,2] A study conducted by the Pew Research Center identified that 35% of American adults attempted to diagnose a medical condition themselves by seeking information on the Internet.[3] It is crucial therefore to recognize the validity of certain health websites and to minimize any false or misleading information.

Hemorrhoids are generally considered benign, but may cause concern when associated with prolapse, bleeding, or pain. A range of treatments exist, including topical preparations, banding, and surgical excision. Hemorrhoids are common, with prevalence estimated at 4.4% of U.S. adults, and as such there is a huge range of information and alternative treatments available, many of which have representation on the Internet.

Websites are constructed by a range of bodies ranging from government and nongovernment organizations and education bodies to commercial health networks and individual clinician advertising.[4] Web content may be generated by nonmedical professionals and be of questionable quality, reliability, or accuracy.[4] Misrepresentation of conflicting and nonscientific views, especially on controversial topics, are common in commercially-funded websites and advertising material. These may bias readers and cause misunderstanding.[5,6]

Websites and forums focusing on complications arising from surgical procedures are common and may provide biased information.[5,7] Patient privacy may be lost on the Internet, and misrepresentation of advice, potentially from nonmedical professionals, may lead to websites inappropriately replacing the doctor–patient relationship.

Several tools have been developed to ensure quality and reliable health information on the Internet.[1] Health On the Net (HON) Foundation is a nongovernmental, not-for-profit organization that is supported by the World Health Organization (WHO). It assesses websites based on a set of core principles, namely that websites should be authoritative, complementary to the doctor–patient relationship, respect visitor privacy, attribute data appropriately, justify claims, display transparency, identify funding sources, and clearly distinguish advertising from editorial content.[8] It then accredits suitable health websites that adhere to these principles.[8] It publishes a toolbar, HONcode, which lights up when an accredited website is visited. This is currently the most widely accepted verification tool used by health information websites.[9]

In this study, our aims were (1) to compare the quality of health information on the Internet related to hemorrhoids by using the HONcode criteria (2) to assess for language differences across 5 Western languages (English, French, German, Italian, and Spanish), (3) to assess the efficacy of the a search engine at prioritising high-quality health information within search result rankings, and (4) perform a quality assessment and comparison of website based on sponsorship source.

Methods

Internet search for websites

We used previously-described methodology.[9–14] Using the Google search engine (http://www.google.com/) we searched for 11 keywords related to hemorrhoids (“haemorrhoid,” “haemorrhoids,” “haemorrhoid surgery,” “haemorrhoid treatment,”

Table 1 Rates of HON-accredited websites among the search terms

Search term	Total websites	% of HON-accredited websites				
		1st 5	1st tertile	2nd tertile	3rd tertile	Total
Haemorrhoid	2936000	35	12.4	8.8	3.6	8.27
Haemorrhoids	16690000	55	19.6	6	4.4	10.00
Haemorrhoid surgery	761050	25	10	6	3.6	6.53
Haemorrhoid treatment	1713000	55	17.6	6	5.2	9.60
Haemorrhoidectomy	212950	15	10	6	2	6.00
Haemorrhoid banding	432500	5	8	4	3.6	5.20
Piles	152817200	15	3.6	0.8	1.6	2.00
External haemorrhoids	1012800	20	11.6	6	6.4	8.00
Internal haemorrhoids	2025500	25	12.8	7.6	4.8	8.40
Thrombosed haemorrhoids	278900	20	10	9.6	4.4	8.00
Haemorrhoid cream	1848000	20	7.2	5.6	5.6	6.13

"haemorrhoidectomy," "haemorrhoid banding," "piles," "external haemorrhoids," "internal haemorrhoids," "thrombosed haemorrhoids," "haemorrhoid cream") and the respective equivalent terms in French, German, Italian, and Spanish. These terms were translated using a reliable translation service and their accuracy confirmed with doctors fluent in French, German, Italian, or Spanish. "Sponsored links" were not included. No user was signed into the search engine during the Internet search, and the browser cache and cookies were cleared between searches. "SafeSearch filters" and "Private results" were turned off. Non-English searches were performed using overseas search engines (http://www.google.fr, http://www.google.de, http://www.google.it, and http://www.google.es for French, German, Italian, and Spanish, respectively).

Verifying accreditation using HONcode

The Health On the Net Foundation's HONcode web browser toolbar (available from http://www.hon.ch/) was installed on a personal computer, showing an indicator to denote accreditation by the HON foundation. This method has been used in multiple previous studies.

For quality control, all websites found in an English search for "haemorrhoids" and "haemorrhoid" were manually evaluated to determine if they adhere to the HON foundation principles (Table 1).

Website sponsorship analysis

An analysis of website sponsorship was carried out for all results for searches in English. Websites were determined to be sponsored by (1) medical practitioners or their societies; (2) government / educational institutions; (3) commercial health networks; (4) nonprofit organizations; (5) alternative therapists; (6) commercial enterprises, including pharmaceutical or medical device manufacturers; and (7) lay media sources, including lawyers.

Analysis of accreditation prevalence by position

The first 150 websites found for each term were divided into tertiles, and the proportion of HON-accredited websites within each tertile was analyzed and compared using the χ^2 test (Fisher's exact tests when cell counts were <5). A separate analysis was performed comparing the first 5 results with the first 50 results. The impact of position on likelihood of HON accreditation was analyzed using analysis of variance (ANOVA) regression analysis, and a line of best fit calculated using linear regression techniques.

Statistical analysis

HONcode accreditation prevalence was compared between languages, tertile, and website sponsor using χ^2 test (Fisher's exact tests when cell counts were <5). All statistical tests were 2-sided, and significance was defined as $P < 0.05$. Analyses involving website position were analyzed using ANOVA regression analysis, treating website position as a discrete quantitative variable. All analyses were performed in Minitab 17 (Minitab Inc., State College, Pennsylvania).

Results

HONcode accreditation prevalence

Our Internet searches returned a total of over 178 million websites. Of the 8250 websites analyzed, 586 (7.10%) were found to HON-accredited. The proportion of HON-accredited websites ranged from

Table 2 Rate of HON accreditation varies by language

Language	HON accreditation
English	10.12%
French	11.33%
German	4.48%
Italian	5.58%
Spanish	4.00%

2.0% (piles) to 10.0% (hemorrhoids) (see Table 1). HON accreditation was greatest in French searches and least in Spanish searches (see Table 2).

Analysis of accreditation prevalence by position

The first 50 results were more likely to be HON-accredited than websites 51–100 (11.2% versus 6.04%; $P < 0.001$) and websites 101–150 (11.2% versus 4.11%; $P < 0.001$). Results were better when considering only the first 5 results of any search (11.2% versus 26.4%; $P < 0.001$), but declined with later search results (ANOVA: $F = 148.27$, $DF = 1$, $P < 0.001$; slope = –0.0901%) (see Fig. 1).

Website sponsorship analysis

English website sponsorship is described in Table 3. These were mainly sponsored by commercial (25.4%); medical practitioners (21.6%); lay media (18.9%); and government / education (18.3%) sources. Websites sponsored by nonprofit organizations were most likely to be HON-accredited (24.6%), followed by commercial (15.5%) and government/education (12.8%). Only 4.1% of medical practitioner websites were HON-accredited.

Table 3 Sponsorship analysis

Sponsor	Prevalence	HON accreditation
Doctor / Doctors' societies	21.56%	4.12%
Government / Educators	18.27%	12.76%
Private hospitals	8.56%	9.74%
Nonprofit organization	3.83%	24.64%
Alternative therapist	3.39%	0%
Commercial	25.44%	15.5%
Lay media	18.94%	5.87%

Quality control analysis

Our quality control analysis found 11/263 (4.18%) HON-unaccredited websites and all 37/37 (100%) HON-accredited websites to abide by the HON foundation principles, correlating with a sensitivity of 74% (95% CI: 62%–86%) and specificity of 100%.

Discussion

The Internet is becoming an increasingly accessible source of health information for the general public, with many up to 76% of adults searching online for health information. With evolving medical and surgical treatment for hemorrhoids, and a variety of information from medical practitioners, commercial enterprises, and others in the health industry, the quality of available information could potential-

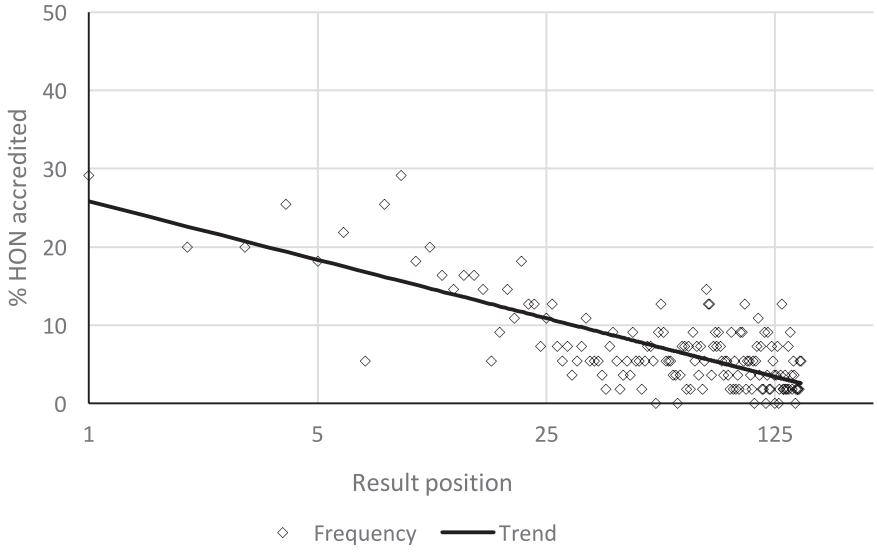

Fig. 1 Later results are less likely to be HON-accredited. Each marker denotes the rate of HON accreditation for websites at that position in the search results. Trend line is shown. Results number is plotted on a logarithmic scale to reflect decreasing traffic on later pages.

ly influence the decision-making and overall satisfaction of our patients.

Less than 1 in 13 websites in this study were accredited by the HON Foundation. This mirrors findings in studies relating to urological conditions,[11,14] with higher rates reported in oncologic studies.[10,13] Although the low rate of HON-accredited websites is concerning, we found that top-ranking results had a significantly higher rate of HON accreditation, reaching one-third of first search result websites. These sites receive greater traffic,[15] with the majority of traffic entering the first 5 results, and far fewer users using results beyond the first page. We expect other health-related searches to mirror these findings, meaning that laypeople are more likely to reach high-quality health information when searching on the Internet.

Informal and colloquial search terms yielded a lower proportion of accredited websites. This is concerning, as lay patients are likely to use colloquial search terms and may find lower quality health information. However, we found the greatest rate of HONcode accreditation with the search term "haemorrhoids," and increasing search term complexity did not increase the rate of HONcode accreditation. This is mirrored in other similar studies.[12] This suggests that patients need only know a technical name for a condition to access the highest quality health information.

As expected,[13] nonprofit organizations are most likely to be HON-accredited but alarmingly, commercial sources had a greater rate of HON accreditation than government and educator sources, and medical practitioner sources. This mirrors findings in other studies.[11] Although we had concerns initially that marketing and commercial interests could bias the available health information, we found the majority of commercially-sponsored HON-accredited websites to be large private hospital networks and commercial health information networks, rather than manufacturers and service marketing. These large firms employ large managerial and editorial teams to ensure correct accreditation of their websites, contrasting with government and education agencies, which often rely on their brand name and sponsorship status to support their impartiality and authority.

Alarmingly, medical practitioners' websites and those of their societies had lower rates of HON accreditation than lay media websites. These websites varied from sites promoting services to websites providing patient information. Medical practitioners may not be aware of HON foundation principles when compiling their websites, and rarely cited source data, breaking the HON principle of attribution. Some may believe it confusing or unnecessary to add source references to patient information documents, choosing instead to rely on their own authority to warrant the reliability of the content. We suggest that with increasing information accessibility and an increasingly well-informed patient cohort, as well as an increasingly anti-expert populist political climate, medical practitioners can no longer rely on status and authority to foster patient trust, and should rather demonstrate scientific backing for their recommendations through referencing and website accreditation.

Of course, there exist other methods of evaluating health information on the Internet. Website writers may follow the eHealth Code of Ethics (www.ihealthcoalition.org), which provides broad guidelines for site evaluation and design. Hi-Ethics (www.hiethics.org) is another nonprofit organization, which publishes further guidelines for website design. For health consumers, there exist tools, such as the DISCERN instrument (www.discern.org.uk), which are validated for use by lay consumers, but are far more intensive to implement than a toolbar icon.

We believe HON-code is currently the most user-friendly method of determining health information quality on the Internet. Toolbar installation is a simple procedure, and identifying accredited websites is straightforward. Yearly reaccreditation ensures compliance with HONcode principles, so consumers restricting their health-related searches to accredited websites can be confident in the quality of health information on these sites.

As uptake is incomplete, however, these consumers will miss out on a significant body of high-quality health information available on unaccredited sites, particularly those written by expert specialist clinicians. Uptake among consumers may be low, and this may be ameliorated with marketing via government or WHO-related sites, general public awareness, smartphone integration, and improvements and modernization of the HONcode website.

Limitations

This study is limited by the presence of false negative HON accreditation. Our quality control analysis found that almost one-quarter of websites following the HON foundation principles were not HON-accredited. HON accreditation was not universally sought by health-related websites. This may be due to lack of awareness, or excessive membership fees (€50–€160 for not-for-profit groups, €160–€325 for

for-profit groups). False positives are minimized by the HON foundation's yearly recertification process, in which websites are reassessed to maintain certification, and this is reflected in a lack of false positive accreditation in our quality control analysis.

The study is also limited by variability in search engine results. Although Google is the most widely used search engine, other search engines may rank websites differently.[16] Even within the same search engine, results are ordered by relevance and importance, which will vary with time based on emerging websites, world events, and consumer trends. In addition, many search engines employ personalized search features, where results are tailored to the signed-in user, Internet protocol address, and location from which the search was performed. Although our methods minimized the impact of these features, lay public experience may differ depending on user and search history(2).

Conclusion

Online health information is an important part of the patient's surgical journey. However, there is a concerning paucity of accredited health information on the Internet. The Google search algorithm, however, returns a greater number of accredited websites in high-ranking results, improving the quality of information read by most viewers. Accreditation of medical practitioners' websites are alarmingly low and as medical practitioners, we should strive to promote high-quality, informative, and ethical health websites and consistent accreditation to improve our patients' decision-making.

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