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Assessing the quality of online information for patients with carotid disease

C.J. Keogh^a, S.M. McHugh^a, M. Clarke Moloney^{a,*}, A. Hannigan^b, D.A. Healy^a, P.E. Burke^a, E.G. Kavanagh^a, P.A. Grace^a, S.R. Walsh^{a,b}^a Department of Vascular Surgery, UL Hospitals, University Hospital Limerick, Limerick, Ireland^b Graduate Entry Medical School, University of Limerick, Ireland

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ABSTRACT

Introduction: Controversy exists relating to carotid endarterectomy (CEA) versus carotid artery stenting (CAS). We aimed to assess the quality of online patient information relating to both.

Methods: The Google search engine was searched for “carotid endarterectomy” and “carotid stenting”. The first 50 webpages returned were assessed. The Gunning Fog Index (GFI) and Flesch Reading Ease Score (FRES) were calculated to assess readability. The LIDA tool (Minervation Ltd., Oxford, U.K.) was used to assess accessibility, usability and reliability.

Results: 20% ($n = 10$) of the webpages returned for CEA were from peer reviewed sources with 34% ($n = 17$) posted by hospitals or health services. Comparatively, for CAS, 40% ($n = 20$) were peer reviewed with 16% ($n = 8$) posted by hospitals or health services. GFI and FRES scores indicated webpages for both CEA and CAS had poor general readability. Webpages for CEA were easier to read than those for CAS (mean FRES difference of 6.7 (95% CI 0.51 to 12.93, $p = 0.03$). Median LIDA scores demonstrated acceptable reliability, accessibility and usability of information for both CEA and CAS webpages. The more readable webpages were not associated with higher LIDA scores for either CEA or CAS webpages.

Conclusion: Webpages providing information on carotid disease management must be made more readable. Online information currently available to patients regarding CAS is more difficult to read and comprehend than CEA.

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1. Introduction

Over the past two decades there has been a dramatic increase in access to and usage of the Internet by the world's population. It is estimated that today 2405 million people use the internet, representing approximately 34.3% of the world's population.¹ Surveys report that 55% of users with Internet access have searched for health or medical information.² There is evidence that 6.75 million health-related searches are performed each day on Google[®] alone.³ Several studies have shown that one of the most frequently searched topics on the Internet is the treatment of a disease or condition.⁴

The common starting point for patients researching online health information is search engines rather than medical portals, the websites of medical societies or libraries.⁵ The Net Market Share

website shows that the most used search engine is Google, controlling 83.85% of the global market share.⁶

The internet is however unregulated and the reliability and readability of information on many websites is questionable. Although the internet is becoming increasingly popular as a source of health information, a recent study reported that amongst the general population, 86% of Internet users expressed concern as to the reliability of the information obtained.² A recent publication by Grewal P et al., assessed online information relating to a number of vascular procedures. The study raised concerns relating to the readability and reliability of online vascular surgery information.⁷

Carotid endarterectomy (CEA) has long been the standard treatment for symptomatic carotid artery stenosis. The introduction of carotid artery stenting (CAS) in recent years has provided another option but for the majority of patients open surgery remains the standard of care. A comparative study of online procedural information between CEA and CAS has not yet been undertaken. As such we sought to assess the reliability, usability, accessibility and readability of online information relating to CEA

* Corresponding author.

E-mail address: mary.clarkemoloney@hse.ie (M. Clarke Moloney).

and CAS for patients researching information regarding treatment options for carotid stenosis.

2. Methods

Using the Google© search engine the keywords “carotid endarterectomy” and “carotid stenting” were searched for. We analysed the top 50 search results on Google as per the keywords. Webpages were excluded from the analysis if they contained irrelevant information, repetition, or were inaccessible.⁷ The content of individual webpages was assessed for readability as the subjects searched for may only be a segment of a certain website i.e. a webpage of that website. However the website in entirety was assessed for accessibility, usability and reliability.

3. Readability scores

The Flesch Reading Ease Score (FRES) rates English text on a 100-point scale and is designed to indicate comprehension level. Higher scores indicate material that is easier to read, for example scores of 90–100 are easily understood by an average 11 year old. The Reader's digest has a readability index of 65, while the Harvard Law Review has a general readability score in the low 30 s. Scores between 60 and 70 represent a standard readability level, easily understood by 13–15 year old students. The FRES can be calculated using the formula: $206.835 - 1.015 (\text{total words}/\text{total sentences}) - 84.6 (\text{total syllables}/\text{total words})$.

The Gunning Fog Index (GFI) also measures the readability of English writing. The index estimates the years of formal education needed to understand the text on a first reading. Lower scores in the GFI indicate material that is easier to read. For Example, a GFI of 6 represents television guides, 10 represents Time magazine and >15 represents academic papers. Texts requiring near-universal understanding need an index less than 8. The GFI can be calculated using the following formula: $0.4 [(\text{words}/\text{sentences}) + 100 (\text{complex words}/\text{words})]$.

To prevent human error during calculations and for ease of use, both readability tests were performed using an online readability calculator.⁸ Some websites also contained multiple webpages about the topic, if these multiple webpages were all relevant to the patient's search, then all webpages were analysed together to give a final result.

4. The LIDA tool

The LIDA tool (Minervation Ltd., Oxford, U.K.) is an online application used to measure the accessibility, usability and reliability of healthcare websites.⁹ Scores greater than 90% represent good results and less than 50% represent poor results. Accessibility answers four questions: Can your audience access your website? Does your website conform to legal accessibility standards? Are your competitors ahead of you? Does your website reflect “best practice” in coding and relevant metadata? Usability is assessed with questions such as: Can your users find what they need to know? Can they use your website effectively? What does it cost people to use your website? Do your website visitors return to use the website again and again? Reliability questions include: does your website keep up to date with the latest research? Does your website reflect best current knowledge? Do your users trust you to provide them with unbiased information? Does your website conform to the highest information quality standards throughout? Is your website harmful or dangerous?

5. Statistical analysis

Descriptive statistics were calculated for readability and LIDA scores, and are presented as mean (SD) for normally distributed variables or median (range) for skewed distributions. Spearman's correlation coefficient was used to measure the association between readability and LIDA scores and between ranking of webpages, readability and LIDA scores. Independent samples *t*-test was used to compare mean FRES readability scores for CEA and CAS webpages. Non-parametric tests were used to compare median GFI and LIDA scores for CEA and CAS webpages. A 5% level of significance was used for all statistical tests and SPSS Version 20 for Windows was used to carry out the analysis.

6. Results

The searches which were performed using the keywords returned 1,959,000 results. Of these 1.16 million were related to CEA and 799,000 related to CAS. We analysed 50 webpages per topic, 100 webpages in total. The 100 webpages which we assessed for carotid endarterectomy (CEA) and carotid artery stenting (CAS) are listed in Table 1.

20% ($n = 10$) of the webpages returned for CEA were from peer reviewed sources, 34% ($n = 17$) were from hospitals or health services while 46% ($n = 23$) were other websites. Comparatively, for CAS, 40% ($n = 20$) were peer reviewed, 16% ($n = 8$) were from hospitals or health services, leaving 44% ($n = 22$) from other websites.

The mean readability scores for FRES for both CEA and CAS indicated poor readability, below a standard readability level [Table 2]. Median GFI scores indicated readability levels required for academic papers for both CEA and CAS [Table 2]. Webpages for CEA were easier to read than those for CAS with a mean FRES difference of 6.7 (95% CI 0.51 to 12.93, $p = 0.03$) and a median GFI difference of 1.5 ($p = 0.045$).

Median accessibility, usability and reliability indicated acceptable levels for both CEA and CAS websites [Table 2] though three websites had reliability scores below 50%.

Association between readability, components of LIDA and total LIDA scores was weak indicating that the more readable webpages were not associated with higher LIDA scores.

The webpages most likely to be accessed are in the first page of search results.⁵ There was a moderate correlation between ranking of the webpages on the first page of results and readability (Spearman's correlation = -0.31) for CEA webpages, this indicated that the higher ranked webpages tended to be more readable. The correlation between ranking of the webpages and readability for CAS webpages was weak. Similarly, top ranked webpages for both CAS and CEA were not associated with higher LIDA scores.

7. Discussion

In 2012 the Pew Research Centre's Internet & American Life Project completed a national survey which showed that one in three American adults have gone online to investigate a medical condition¹⁰ reporting that 59% of U.S. adults have looked online for health information in preceding 12 months. Furthermore 53% of patients self-diagnosing online spoke with their clinician about the online information they had reviewed, and that 41% had their condition confirmed by a clinician. Much of the healthcare related information on the Internet is unreliable¹¹ and this may negatively impact patient decision making when faced with potential treatment options offered by their physicians or surgeons.¹²

The webpages that we analysed had poor readability. Interestingly, the results from CAS and CEA differed in that information

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