The internet as a source of information for De Quervain's tendinitis

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Abstract

Background Many individuals are turning to the Internet for information about various health conditions, and in our study we evaluated the quality and readability of information on the internet about De Quervain's tendinitis.

Methods We chose the search terms "De Quervain's Tendinitis," "De Quervain's Tenosynovitis," and "De Quervain's Syndrome," and entered them into the search engines "Google," "Bing," and "Yahoo" and compiled the search results. The websites were then evaluated and assigned a quality score, a Flesch-Kincaid (FK) reading level, and a subjective quality score. They were then grouped according to the search term used, search engine used, and the order (priority) returned by the search engines. ANOVA analysis and pairwise comparisons of quality and readability among groups, as well as correlation analysis were performed.

Results The FK readability average was 10.3, above the recommended level. The search term De Quervain's tenosynovitis returned the highest objective quality results. There was no statistical difference found between the different search engines. The first 10 results from the searches were of higher quality than results 11–20, and there was a positive correlation between objective and subjective quality scores but no correlation between readability and objective quality.

Conclusions We concluded that quality information about De Quervain's tendinitis is available on the internet and is most likely to be found using the search term De Quervain's

tenosynovitis and in the first 10 results of an internet search. However, most information is written above the recommended 6th grade reading level.

Keywords De Quervain's tenosynovitis · Internet · Reading level

Introduction

As the practice of medicine continues to evolve, the Internet has proven to be an incredible source of information for both physicians and patients, and its usage is increasing [18, 24]. It has allowed patients to become more aware of the various health conditions that they face and the treatment options available to them. It has also played a role in encouraging increased patient autonomy and shared decision making among patients and physicians [20]. For this change in medical care to be successful however, it is imperative that patients have access to accurate and understandable information. Generally, Internet websites have been valuable learning tools for patients. Unfortunately, there is concern about their variability in regards to quality and readability of information depending on the authorship and several other factors [7, 26]. In one study, websites seeking commercial gain were shown to provide lower quality information than those not seeking commercial gain [13].

Thus, as more patients turn to the Internet for health information, it is critical that physicians are aware of what information is available [8, 26] and how to access that information so that they can guide their patients to sources that will augment the shared decision making process rather than undermine it.

Previous studies have assessed the quality of medical information from specific websites, based on search terms, and also based on specific medical topics [3, 7]. Since most

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information on the Internet is acquired by search engines [9, 24] we chose to assess the quality of information available on the Internet specifically for De Quervain's tendinitis. We utilized a similar model to that performed by Dy and colleagues for lateral epicondylitis [7]. In our study, we used the search terms ("De Quervain's Tendinitis," "De Quervain's Tenosynovitis," and "De Quervain's Syndrome") entered into three different search engines, to assess the objective and subjective quality and readability of the websites returned by the searches. We hypothesized that there would be a difference in quality and readability of information based on search term used, whether a website was found on the first or second page of a search, and which search engine was used.

Materials and Methods

Materials consisted of a computer connected to the Internet and the software programs Microsoft Excel and Word (Microsoft Corporation, Seattle, WA). We chose the search terms, "De Quervain's Tendinitis," "De Quervain's Tenosynovitis," and "De Quervain's Syndrome" and entered each term into three of the most commonly used search engines "Google," "Bing," and "Yahoo" for a total of nine searches [17]. The first 25 websites from each search, excluding videos and links to videos, were accessed. The website addresses were digitally copied into a Microsoft Excel document for a total of 225 websites. The searches were all performed on October 5th, 2013 within a 3-h time frame, and after each search, caches and cookies were cleared.

After the websites were compiled, a list as seen in Table 1 was created with 30 criteria to evaluate the quality of the information contained in each website. The criteria were based on and patterned after the information available in the article "De Quervain's Tendinitis" on the American Academy of Orthopedic Surgeons patient website orthoinfo.aaos.org [5] similar to other studies [7, 10]. Using these criteria as a rubric, each of the unique websites were evaluated and assigned a score from 0 to 30 points, 30 being the maximum if all of the criteria were present in the website's materials. During the evaluation process, each website was also assigned a subjective score based on the question "How would you rate the overall quality of the website in gaining an understanding of the problem?" The scores ranged from 1 to 5 with each number representing the following: 1 very poor, 2 poor, 3 fair, 4 good, and 5 very good. Three 5th year orthopedic surgery residents reviewed the individual websites.

Once quality scores were assigned, the readability of each website was assessed by inputting the website material into Microsoft Word and obtaining the Flesch-Kincaid reading grade level. This method has been used in the past in multiple studies [1, 4, 9, 11, 14, 16, 19, 21, 22]. The reading level

Table 1 Sample evaluation sheet used to assign the objective quality score

Quality criteria (adapted from the AAOS website)	Points
Discusses diagnosis and evaluation	
Mentions involvement of tendons located on the thumb side of the wrist	
Mentions problem involves swelling or irritation of the tendons	
Gives an initial overview of the problem	
Generally describes anatomy of the problem	
Explains the term tendon and tendon sheath and their function	
Explains the term synovium and its function	
Generally describes the causes of the problem	
Specifically mentions it is a problem of overuse	
Mentions an association with pregnancy, or arthritis	
Mentions it occurs more commonly in females	
Generally describes the symptoms of the problem	
Specifically mentions it is associated with pain over the thumb side of the wrist	
Mentions that the onset can be sudden or gradual	
Mentions any of the following associated symptoms: Swelling, Catching/Snapping with thumb movement, Difficulty with thumb movement, Numbness on the back of the thumb and/or index finger	
Generally describes how the diagnosis is made	
Specifically mentions the Finkelstein test and how it is performed	
Discusses the expected findings of a positive test	
Generally describes treatment for the problem	
Specifically mentions goals of treatment	
Discusses non-surgical treatment (1 point for each of the following; 4 points max): 1) Splinting 2) Anti-inflammatory medication 3) Rest 4) Corticosteroids	
Discusses surgical treatment	
Discusses indications for surgical treatment	
Discusses expectations after surgical treatment	
Mentions length of time until normal hand use may be resumed after surgery	
Mentions long term outlook and complications associated with the problem	
Provides links to more detailed information or to find a physician.	
Total points	
Subjective quality	
How would you rate the overall quality the of website in gaining an understanding of the problem?	
5- Very good, 4- Good, 3- Fair, 2- Poor, 1- Very poor	

One point was assigned for each item if the website contained that information. One of the items had four unique features to evaluate and for each one present, one point was assigned for a maximum of four points. A total score with a maximum of thirty was then assigned

assesses the general public's ability to understand the material from each website.

After both reading grade level and quality scores were assigned, the websites were grouped according to search term used, search engine used, order of results (whether the website was found in the first 10 websites of a search or 11–20), by

reading level, and by subjective score. For those grouped by search term, all of the unique websites found using that term, from all three search engines, were included. The search engine grouping and comparison of websites was done for each search term individually and for all three search terms collectively. This was to determine if there was a difference in the quality and readability of websites found using one search engine versus another for each search term. The grouping of reading level and subjective score was to see if there was a correlation between each of these and the objective quality of the website. The grouping of order of website results was performed to determine if those websites found on the first page after a search (i.e., websites 1–10) were of higher quality than those from later pages (i.e., websites 11–20). The top 10 and bottom 10 results from the original searches, from all search terms and search engines, were stratified and compared. For this grouping, two different analyses were performed. In the first analysis, duplicates were not excluded to take into account the average frequency at which a certain website was found in the top or bottom 10. In the second analysis, duplicate websites were excluded.

Normality of data was evaluated in Microsoft Excel using a bell curve model with randomly generated numbers for each individual data set. Analysis of variance tests (ANOVA) with post hoc pairwise analysis was performed to determine any difference in objective quality, and readability for search term used, search engine used, and order (priority) of results. Tests for a difference in subjective score were performed for order (priority) of results. Correlation analysis was used to determine if there was an association between subjective quality and objective quality, and between reading grade level and objective quality. Threshold for statistical significance for all tests was <0.05 . For ANOVA tests, 0.05 was used as the alpha value.

Results

Initially, 225 websites were identified. Duplicate results were eliminated leaving a total of 84 unique websites. Then, upon further examination of the websites, it was noted that two additional sites were duplicates, seven did not contain enough information to evaluate, and one was no longer available to view. These were excluded leaving a final of 74 websites, which were assigned an objective and subjective quality score. The top 20 websites, ranked by objective score can be seen in Table 2.

Results for all 74 websites combined were as follows: objective quality $[20.7 (\text{mean}) \pm 4.4 (\text{SD})]$ of a maximum score of 30; range 9–27], subjective quality $[3.5 \pm 0.99]$ of a maximum score of 5; range 1–5], and Flesch-Kincaid reading grade level $[10.3 \pm 2.3]$; range of 5.3–15.4]. All of the data was normally distributed. Of the 74 websites, only four were at

or below the recommended 6th grade reading level with 85 % of the websites above the 8th grade reading level and 22 % above the 12th grade reading level. Forty-nine percent of the websites were subjectively considered to be of good to very good quality, 39 % were considered fair quality, and the remaining 12 % were either poor or very poor.

Three 5th year orthopedic surgery residents (each with a kappa score of 0.9) reviewed the websites and were supervised by one fellowship trained orthopedic hand surgeon.

Results for the analysis of the different groupings of websites as described above are as follows:

Group by Search Term

There was a significant difference in objective quality of information when the different search terms were compared via ANOVA analysis and post hoc pairwise analysis, specifically between the search terms De Quervain's tenosynovitis (22.3 ± 3.3) and De Quervain's syndrome (19.6 ± 4.8 ; $p < 0.007$) as seen in Figure 1. There was no significant difference between the other pairings of search terms. There was also no significant variance in readability among the different terms.

Group by Order (Priority) of Result

When the first 10 results from all searches were combined and compared to results 11–20 from all searches, the group of the first 10 websites showed a higher average score for both objective (23.1 ± 4.1) and subjective (3.9 ± 0.98) quality scores compared to the websites 11–20 with objective and subjective scores of 19.8 ± 4.2 and 3.4 ± 1.0 , respectively. When compared with a two-sample *t* test, both of these differences were statistically significant, $p < 0.001$ for the objective score and $p < 0.003$ for the subjective score. There was no difference in readability between the two groups. When the duplicate results from the combined searches were excluded, there was no significant difference found in any of the groups.

Group by Search Engine

There was no significant difference found in the objective quality or readability of information returned from the three search engines used in the study. This was true both when individual search terms were used and when all of the search term results from each search engine were combined.

Correlation Analysis

Correlation analysis was performed to assess the relationship between readability and objective quality and also between the subjective score and objective quality. There was a significant correlation between the subjective score and objective score with a higher subjective score being associated with a

Table 2 List of the 20 websites ranked according to quality score

	Website name	Website address	Quality score (0–30)	Subjective quality score (1–5)	Reading level
1	AAOS	http://orthoinfo.aaos.org/topic.cfm?topic=a00007	27	4	7.5
2	Webmd	http://www.webmd.com/rheumatoid-arthritis/de-quervains-disease	27	5	8.7
3	Samimi	http://samimimd.com/de-quervain-tendonitis.html	27	4	7.7
	Orthopaedic Group				
4	Cleveland Clinic	http://my.clevelandclinic.org/orthopaedics-rheumatology/diseases-conditions/de-quervains-disease.aspx	27	5	9.1
5	Seton Healthcare	http://www.seton.net/health_a_to_z/health_library/illnesses_and_conditions/de_quervains_tenosynovitis	27	5	6.8
6	Trammell & Mills	http://www.trammellandmills.com/dequervains_tendinitis.php	26	4	10.4
7	ICP Physical Therapy	http://www.ipcphysicaltherapy.com/DeQuervainsTendinitis.aspx	26	5	8.9
8	eOrthopod.com	http://www.eorthopod.com/content/de-quervains-tenosynovitis	26	5	8.3
9	Orthogate	http://www.orthogate.org/patient-education/wrist/de-quervains-tenosynovitis.html	26	5	8.3
10	Houston Methodist	http://www.methodistorthopedics.com/de-Quervains-Tenosynovitis	26	5	8.3
11	Morphopedics.com	http://morphopedics.wikidot.com/dequervain-s-disease	26	5	13.5
12	Mayoclinic	http://www.mayoclinic.com/health/de-quervains-tenosynovitis/DS00692	25	5	11.4
13	Wikipedia	http://en.wikipedia.org/wiki/De_Quervain_syndrome	25	4	14.8
14	Trinity Hand Specialists	http://www.trinityhand.com/de-quervains-tendonitis/	25	4	9.5
15	med.und.edu	http://www.med.und.edu/users/jwhiting/deQuervain's.html	25	4	13.1
16	Family Doctor.org	http://www.familydoctor.org/familydoctor/en/diseases-conditions/de-quervains-tenosynovitis.html	25	5	7.6
17	Ohio Health	http://www.ohiohealth.com/pagelayouts/mayo.aspx?id=5725	25	4	9.6
18	Aesthetic Day Surgery	http://www.aestheticdaysurgery.com.au/surgical-procedures/hand-surgery/de-quervains-stenosing-tenosynovitis	25	4	9.5
19	The Core Institute	http://www.thecoreinstitute.com/hand/de-quervain-s-tendinitis.html	24	5	10.5
20	Medscape	http://emedicine.medscape.com/article/124387-overview	24	4	1.1

higher objective score (correlation coefficient $r=0.85$). There was no correlation between readability and the objective quality score (correlation coefficient $r=-0.19$).

Discussion

Many patients turn to the Internet for health information in addition to the information that they receive from physicians. This emphasizes the importance of the physician's ability to direct their patients to quality information that is understandable to a wide audience. Previous studies have shown that health information on the Internet can vary significantly in quality [6, 7, 12]. In our study, we observed a similar trend—less than half of the websites reviewed were considered good quality. We found the average reading grade level was 10.3, well above the recommended 6th grade reading level [25]. Only 15 % of websites were written below the 8th grade reading level. These findings suggest areas for improvement for the authors of websites, especially considering that lower

literacy has been associated with poor health outcomes [2]. Unfortunately, one limitation to ours and other similar studies is that there is no consensus as to what is considered “good” quality. This presents a challenge when trying to determine a rubric by which to measure other websites. Additionally, our analysis is limited to only one medical topic, which makes it less generalizable to health information on the Internet in

Fig. 1 Average objective quality score (by search term)

general. Nevertheless, it does provide insight into avenues for physician endorsement of health information websites.

One variable is the search term the patient decides to use. Many medical topics have synonymous terms that will return similar results but not always similar quality results. In our study, we demonstrated that certain search terms return higher quality results than others. De Quervain's tenosynovitis demonstrated the highest average quality results followed by De Quervain's tendinitis, and De Quervain's syndrome. This knowledge will be useful to help guide patients to appropriate websites. Unfortunately, this information is specifically applicable to De Quervain's tendinitis.

Another aspect to consider for patients and health care professionals is how many pages into a search engine patients should go. One of the more striking findings in our study was that on average, websites found in the first 10 results were of significantly better quality than those found on the second page (i.e., websites 11–20). This was true when the frequency of the results was factored by not excluding duplicate websites. There was no difference when the duplicate websites were excluded in the analysis. This may be explained by the observation that the duplicate results in the 1–10 group were of higher objective and subjective quality than those in the 11–20 group. When the duplicate websites were excluded, there were only 30 unique websites remaining for the 1–10 group and 49 for the 11–20 group. Before duplicate exclusion, the number of websites was nearly equal at 84 and 78, respectively. This suggests that higher quality websites are accessed more frequently. Furthermore, there is less website variability in the 1–10 group compared to the 11–20 group. Similarly, another study found the first five websites found in a search had greater information accuracy than later search results [8]. Unfortunately, it is very difficult to know if this correlation is true for other medical topics without further research. If true, however, it may be especially useful since many patients may only search through the first several websites they encounter. One of the problems with these findings is that our study was conducted under controlled circumstances with cookies and caches being cleared with each search. This is something many patients may not do, influencing which websites appear first.

We also found that objective quality and readability of information did not differ between the different search engines used in the study. This can provide physician with reassurance that the search engine used is not the limiting factor toward access of good health information.

Correlation analysis demonstrated a relationship between the assigned subjective quality score and the objective quality score. However, there was no correlation between readability and objective quality. It demonstrates that websites written with higher reading levels will not necessarily be of higher quality and vice versa. Whether this is true for other medical topics is yet to be determined. This may also be important

information for website designers as they will need to focus on both the readability and quality of information.

Overall, the results from our study suggest that quality information about De Quervain's tendinitis is available on the internet and is more likely to be found in the first 10 results from any of the three search engines, "Google," "Bing," or "Yahoo" using the search terms De Quervain's tenosynovitis or De Quervain's tendinitis. However, those criteria alone will not always ensure that patients find information that will guide them to appropriate healthcare decisions. With this knowledge, it is important that individual healthcare providers educate their patients on how to find quality information. One consideration is to highlight individual websites that consistently provide quality, understandable information for a variety of topics, instead of focusing on which search engine and terms are most useful. More consistent high quality information may be found this way. Further research needs to be performed to see whether these websites return similar quality results for other topics beyond what has already been done [15]. Further studies can focus on the way patients and providers can better understand how to help each other take full advantage of the incredible amount of health information on the Internet [23].

Conflict of Interest James C. Heap does not have any conflicts of interest.

Bobby Dezfuli does not have any conflicts of interest.

David M. Bennett does not have any conflicts of interest.

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