Content and design of patient-targeted websites in orthopaedic surgery: the example of total hip replacement

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ABSTRACT

INTRODUCTION The Internet is frequently used as a source of medical information by patients. There is no shortage of quantity of information on the Internet. Most studies have concentrated on the content of information provided by orthopaedic websites. This study aims to assess all aspects of website construction, using total hip replacement (THR) as an example.

MATERIALS AND METHODS Using the search term 'total hip replacement', we evaluated the top 50 results from 4 popular search engines. A detailed evaluation of these sites was carried out and data recorded on authorship, readability (Flesch score), authority, currency, information status, information value, information quality, graphics and design, navigation, speed and access. These were individually scored using the University of Michigan Consumer Health WebSite Checklist.

RESULTS From the 200 web pages, 167 unique Uniform Resource Locators (URLs) were recorded. Of these, 55 provided patient information about THR and were evaluated fully. Of websites, 62% originated in the US. The authorship of the majority of websites was described as commercial (28%) or academic/physician (49%). Website evaluation showed that content, navigation, graphics and speed were good. However, authority, currency, information status, information quality and ease of reading scored poorly.

DISCUSSION Most of the sites visited presented adequate information about THR. However, the manner in which this information was presented is poor.

KEYWORDS

Internet – Orthopaedic surgery – Total hip replacement – Information quality

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The development of the Internet began in the US in the 1970s. Its initial objective was to allow communication between organisations in the event of a nuclear war. However, the function of the Internet has spread way beyond these first aims and it is now ubiquitous.

It has been shown that the Internet is a commonly used source of information for patients attending orthopaedic out-patients.¹ The Internet is now being used as a source of medical information as computer literacy has increased. In 2003, it was estimated that 4.5% of all searches were for health-related information.² Regulation of the Internet is a difficult prospect and it would be effectively impossible to deny access to sites of low quality. Despite the infancy of the Internet there are already several organisations that offer themselves as markers of quality (*e.g.* Health On the Net <www.hon.ch> and Organising Medical Networked

Information <www.omni.ac.uk>). As experience with the Internet grows, the number of bench-marks is set to increase. No single organisation could hope to review all of the websites that give information about a single condition. For example, the term hip replacement produces over 2,340,000 hits (<www.google.com>). Patients are unlikely to be aware of the various methods of bench-marking orthopaedic websites or of specific orthopaedic search engines such as Orthopaedic WebLinks (<www.orthopaedicweblinks.com>). For the well-informed orthopaedic surgeon, it may seem obvious which websites are of value and which are worthless. Subtle bias and selective presentation of data will be difficult for a lay-person to detect.

In 1997, Silberg *et al.*³ described four core standards for any medical website. These are authorship, attribution

Table 1 University of Michigan Healthcare Website Checklist: summary of categories evaluated

	Description	Maximum score	Mean score
Content			
Authority	Identity and qualifications of author	10	4
Currency	Last revision date	3	1
Information status	Copyright and restrictions on use	4	1
Information value	Content of website	24	14
Information quality	References, bias, conflict of interest, errors and omissions	13	-2
Usability			
Graphics and design	Colour, picture quality, animation, lay out	12	5
Navigation	Site map, help screen, page title	10	6
Speed	Availability of website on 3 consecutive days	2	2
Access	Deadlinks, fee for use, ease of use, comparison to related websites	10	3
Total		90	33

(references and sources for content), disclosure (website ownership and conflicts of interest) and currency (date of website creation and any updates). These four standards are similar to the basic criteria we would expect of any article in print. They do not ensure the quality of the content of the site but provide a foundation on which the content may be fairly judged. Added to these core standards are considerations such as content, readability, links to other sites, site construction, ease of navigation and access and speed of use. If a website can address all of these issues successfully, then it must stand a good chance of providing valuable information and knowledge to the reader. The content of orthopaedic websites has tended to be the focus of studies published to date. As important as content is the way in which information is presented, the overall design of the website and the four core standards of Silberg *et al.*⁵ These issues are not covered in the current literature.

This aim of this study was to assess complete design of orthopaedic websites, using the example of total hip replacement (THR). Following this comprehensive assessment, we hope to be able to make recommendations on the construction of such sites and the presentation of information.

Materials and Methods

THR was chosen, as it is a commonly performed operation that has well-defined risks. In addition, there are innovative new treatments that are available which have potential benefits over conventional THR. For example, resurfacing arthroplasty of the hip, the use of hard-bearing surfaces and minimally invasive techniques. It is important that the

potential benefits of these procedures are put in the context of the success of 'conventional' THR, which remains the gold standard arthroplasty of the hip.

Identification of websites

The phrase 'hip replacement' was entered into the Google (<www.google.com> and <www.google.co.uk>), MSN (<www.MSN.com>) and Lycos (<www.lycos.com>) search engines.⁴⁻⁷ Google is the most commonly used and comprehensive search engine. It also provides the search engine for Yahoo, Netscape and AOL. Lycos is powered by the search engine AllTheWeb (<www.AllTheWeb.com>).⁸ The top 50 websites from each search were selected and their universal resource locator (URL) recorded. Websites containing information aimed at informing patients about THR were selected for this study. Websites that were identified that did not have information designed to inform patients about THR were evaluated for authorship and not further examined.

Website evaluation

AUTHORSHIP

The country of origin of the website was recorded as UK, USA, other or unknown. The institution constructing the website was recorded under one of the following headings: academic, physician, non-physician caregiver, commercial, commercial product, lay and unknown. The precise definitions of these groups have been previously described.⁹ News agency was recorded as an additional source, where the website identified was an article from a newspaper or a news agency.

READABILITY

The readability of the site was calculated using a standard test of readability – the Flesch score.¹⁰ This score is based on the average sentence length and the average number of syllables per word. A score from 0 to 100 is produced, with a higher score indicating increasing ease of reading. The reading age can be calculated using the Flesch-Kincaid formula, which relies on the same data. The sentences containing the first 100 words of the patient information text were scanned to calculate the score. A score of 60 is considered the minimum for 'plain English'.

ASSESSMENT OF WEBSITES

A detailed evaluation of each website was carried out, based on the University of Michigan Healthcare Website Evaluation Checklist.¹¹ The evaluation was carried out on two separate occasions, 12 weeks' apart. The websites were scored on 57 separate questions, which fall into the following categories: authority, currency, information status, information value, information quality, graphics and design, navigation, speed and access (Table 1). All of these categories are generic to any medical website except for information value. Information value is a description of the content of the site. To score full marks, a website should identify and describe the procedure, defining relevant medical terms. Indications for treatment and alternative treatments should be given. There should be links to sites offering additional consumer and professional level information and a contact address. An accurate assessment of risks and benefits should be present with no misleading recommendations. Relevant case reports may be described.

Results

A total of 200 web pages were identified. Of these, there were 167 individual URLs, with 33 duplicated sites. The origin of the site was US in 103, UK in 51 and other countries in 4 (Australia 3 and Thailand 1). In three cases, it was not possible to determine the country of origin. The URL was unavailable in 5 cases and one website required the user to pay to register and was excluded. The authorship is given in Table 2. The most common category of author was academic and only one site could not be classified (Table 2). Of the 167 web pages, 55 contained information about THR. The other 112 web pages did not provide any information that could be judged to be of any value in informing patients about THR (Table 3).

The mean Flesch score was 55.5 (range, 19.0–73.2; SD 12.9). The higher the score the simpler a piece of written text is to read. This result is similar to the score for *Time* magazine (Time Inc. USA). The mean reading age (Flesch-Kincaid) was 16.32 years.

Table 2 Authorship of websites

Category of author	n (%)
Academic	46 (29)
Commercial	39 (24)
Physician	29 (18)
News agency	21 (13)
Non-physician care provider	7 (4)
Lay-person	6 (4)
Commercial product	7 (4)
Unidentified	7 (4)
Total	167 (100)

Website assessment

The University of Michigan score ranged from 1 to 68 (mean, 33.1) out of a total possible score of 90. The full breakdown of the scoring is given in Table 1. The websites were scored on two separate occasions by one of the authors. The mean difference in the scores on these two occasions was –1 (SD 9.8). The difference was not significant (paired Student's *t*-test, $P = 0.52$). The repeatability coefficient is given by the SD of the differences multiplied by 2 (*i.e.* $2 \times 9.8 = 19.6$). Of all observations, 95% should fall within the upper and lower limits of agreement (mean difference, ± 19.6). In this study, none of the values were outside these limits. The non-significant Student's *t*-test result indicates there is no evidence of bias. The mean difference of –1 indicates that any differences are randomly scattered around a mean of approximately zero. Taken together, these tests suggest that the intra-observer agreement is acceptable.

Table 3 Reasons for exclusion of websites

Reason for exclusion	n
No relevant information	22
Brief news article	17
Journal article	10
Unrelated to THR	18
Advert – healthcare institution	6
Advert – physician	2
Advert – other	10
Canine THR	7
Lawyer	10
Total	112

Discussion

Information value scored highly, indicating that, in most cases, the content of the websites was adequate. Websites were easy to access and none of the sites visited were ever unavailable. Navigation was simple, although there was rarely a help screen, which may well have been useful to the lay-person. Colour and graphics enhanced many of the sites although the graphics were rarely referenced in the text. Only one website was interactive with the user, asking questions to reinforce learning points such as complications of surgery. The Internet is ideally suited to interactive learning and this is an area that has been significantly underutilised.

The Flesch score was lower than desired. To make a piece of text easier to read, words and sentences should be kept short. This could be improved by substituting complex medical terms for shorter lay-man's words. The average reading age of an adult in the UK may be as low as 9 years. A previous study examining the readability of patient information on diabetes mellitus found a median reading age of 14.65 years, which is similar to our result of 16.32 years.¹² The reading ability of the average UK adult must be taken into account when writing for patients.

It was unusual for an individual author to be named or their qualifications to be given. Intellectual property rights were rarely stated beyond a simple copyright symbol. There was occasional use of animation; however, most animation was part of sponsored advertising on the websites. The majority of websites were designed by 'interested' parties such as hospitals, physicians and implant companies. Therefore, a conflict of interest was frequently present. Under these circumstances, it seems even more important that the author be clearly identifiable. There was almost never a bibliography. Subtle bias and selective presentation of information was common but blatant errors and misleading information was rare, but significant.

It is the core attributes that we would expect of an article in print that are missing.¹⁵ These are authorship, currency, attribution and disclosure.⁵ Unless these basic criteria are included, it is difficult to make any judgement of the quality of the information presented.

This study has concentrated on the overall package that a website presents rather than the content alone. We have used a scoring system in an attempt to quantify differences between websites. The intra-observer agreement of this scoring system is satisfactory. Given the large number of questions and possible scores, it is not possible to quantify this accurately. It is likely that the interobserver error (reproducibility) would be less good. The scoring system is a valuable tool in the comparison of many different websites, allowing the strengths and weaknesses of websites as a whole to be detected. We have only performed this study on a single medical treatment. It is likely that the deficiencies in the design of websites in relation to THR are the same as with other medical problems. A medical professional performed

searches in this study and we believe that patients may not necessarily search the web using the same methods or be as discerning in the websites that they visit. In addition, they are unlikely to visit as many websites as this study did and, therefore, may get a less balanced picture of the problem they are researching. Further studies could examine the search strategies employed by patients and the websites that they find using these methods.

Conclusions

Based on the results of this study and an analysis of the common errors made in the construction of patient targeted websites, we make the following recommendations that medical websites should:

1. State the author, qualifications and conflicts of interest.
2. Include a most recent revision date.
3. Clearly state restrictions on use of information provided.
4. Present a balanced picture with comparison to available 'gold standards'.
5. Provide evidence and links to further information sources.
6. Include simple graphics, avoiding distracting animation.
7. Avoid medical words when lay-man's language will do as well. Alternatively, provide a glossary.
8. Consider creating sensible use of interactive elements to the website.

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