Original article

Breast reconstruction post mastectomy- Let's Google it. Accessibility, readability and quality of online information

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A B S T R A C T

Introduction: This study evaluated the readability, accessibility and quality of information pertaining to breast reconstruction post mastectomy on the Internet in the English language.
Methods: Using the Google© search engine the keywords "Breast reconstruction post mastectomy" were searched for. We analyzed the top 75 sites. The Flesch Reading Ease Score and Gunning Fog Index were calculated to assess readability. Web site quality was assessed objectively using the University of Michigan Consumer Health Web site Evaluation Checklist. Accessibility was determined using an automated accessibility tool. In addition, the country of origin, type of organisation producing the site and presence of Health on the Net (HoN) Certification status was recorded.
Results: The Web sites were difficult to read and comprehend. The mean Flesch Reading Ease scores were 55.5. The mean Gunning Fog Index scores was 8.6. The mean Michigan score was 34.8 indicating weak quality of websites. Websites with HoN certification ranked higher in the search results ($p = 0.007$). Website quality was influenced by organisation type ($p < 0.0001$) with academic/healthcare, not for profit and government sites having higher Michigan scores. 20% of sites met the minimum accessibility criteria.
Conclusions: Internet information on breast reconstruction post mastectomy and procedures is poorly written and we suggest that Webpages providing information must be made more readable and accessible. We suggest that health professionals should recommend Web sites that are easy to read and contain high-quality surgical information. Medical information on the Internet should be readable, accessible, reliable and of a consistent quality.

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1. Introduction

"Just Google it!" is becoming our standard response to unanswered questions in life and it would appear information regarding our health is no different. The internet is an increasing source of healthcare associated information for the general population with a rising number of patients accessing medical information online [1]. This has been shown to be especially true with regard to cancer-related information overall and breast cancer in particular [2,3].

In addition to information provision, internet sourced information has also been shown to be a factor influencing patient decisions with regard to their treatment [4]. Patient choice is a critical aspect of the decision making process in choosing a reconstruction option in any patient post mastectomy however for online information to be valuable, it must be both accurate and accessible to patients. Medical-based websites on the internet lack regulation and may potentially provide inaccurate information to patients. Internet search engine results for medical information queries may not be specific to the individual patient's questions [5,6].

The common starting point for patients researching online health information is search engines rather than medical portals, websites of medical societies or libraries [7]. Finding accurate breast cancer information on the internet is difficult due to large numbers of unregulated websites preferentially returned via search engines [5].

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Although there is an increasing trend towards breast conserving surgery (BCS) in the treatment of breast cancer there is still a significant amount of women who will need a mastectomy for oncology purposes or who choose to have a mastectomy as their treatment option. Indeed recent evidence suggests a significant trend toward higher proportions of BCS-eligible patients undergoing unilateral or even bilateral mastectomy with immediate or delayed breast reconstruction [8]. Breast reconstruction offers aesthetic and psychological advantages that contribute significantly to patient satisfaction and quality of life [9,10]. Therefore we concluded that it is pertinent to assess the online information these individuals who undergo mastectomy will have at their disposal regarding reconstruction options. We set out to examine the quality and readability of patient information in regards to breast reconstruction post mastectomy on the World Wide Web (WWW). It has been suggested that 6.75 million health-related searches are performed each day in Google alone [7]. The Net Market Share website shows that the most used search engine is Google, controlling 83.85% of the global market share [6].

2. Methods

Using the Google© search engine the keywords "Breast reconstruction post mastectomy" were searched for. Because most consumers visit fewer than 25 sites found on a search, with most links being in the top five rank of the search results, we analyzed the top 75 sites [11]. Web pages were excluded from the analysis if they contained irrelevant information, repetition, or were inaccessible.

Each Web site was assessed independently by two of the authors (S.A. and B.L.) for quality and readability as directed by the instructions supplied with the tools used. In addition, the country of origin, type of organisation producing the site (commercial company, health care provider, academic institution, charitable organization, layperson, government, or news outlet) and presence of Health on the Net (HoN) Certification status was recorded. The Health on the Net (HoN) organisation provides a listing of websites deemed by the Economic and Social Council of the United Nations to be a reliable and useful source of healthcare associated information [12]. However, although websites undergo examination before inclusion, registration with this organisation is entirely voluntary.

2.1. Quality

Web site quality was assessed objectively using the University of Michigan Consumer Health Web site Evaluation Checklist to generate an overall Michigan score of 80 possible points (Table 1 Appendix 1). The tool produces a profile of 10 domains focusing on the quality of the content (as rated by the reviewer in the context of the subject of the site) and the usability and design of the site: authority, currency, information, scope and selection, audience, value, accuracy, advertising, navigation, speed, and access. The scoring tool comprises 43 separate yes/no questions, each associated with a marking scheme [13].

2.2. Readability

Readability is defined as the ease in which text can be read and understood. Many scoring systems exist to assess readability. We used the two most reliable readability formulas.

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. Scores between 60 and 70 represent a standard readability level, easily

understood by 13–15 year old students (Table 2 Appendix 1) [14].

The Gunning Fog Index (GFI) also measures the readability of English writing (Table 3 Appendix 1). 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 [6,15].

To prevent human error during calculations and for ease of use, both readability tests were performed using an online readability calculator.

2.3. Accessibility

Website accessibility is an important aspect of any site. Concomitant visual and auditory impairment often necessitate add-on or assistive technologies prompting US and UK legislators to institute minimum accessibility requirements for websites based on the "Web Content Accessibility Guidelines" (WCAG) [16]. The absence of WCAG violations was determined using an automated accessibility tool (Functional Accessibility Evaluator). Website addresses were entered into each accessibility tool by 1 author (S.A.) and results generated automatically. Violations are classified as priority 1–3, with priority 1 violations being the most serious. Websites with no priority 1 violations have conformance level A. This is the minimum requirement for a site to be considered accessible [16].

3. Statistical analysis

Descriptive statistics were calculated for readability and quality scores, and are presented as mean (SD) for normally distributed variables or median (range) for skewed distributions. All correlations were Pearson, Group means were compared using unpaired t tests or one way ANOVA (with Tukey post-hoc test) for multiple comparisons. All analysis was performed using GraphPad Prism. ©

4. Results

The searches which were performed using the keywords returned 526,000 results. We analyzed the first 75 webpages in total. 71 of these were suitable for analysis. Four were excluded due to inaccessible links or irrelevancy.

27% (n = 19) of websites were of a commercial nature, 21% (n = 15) were from a news outlet website, 20% (n = 14) were from healthcare or academic websites. The remaining sites were 16% (n = 11) from non for profit websites and 8% (n = 6) from government and layperson blogs/websites respectively (see Fig. 1).

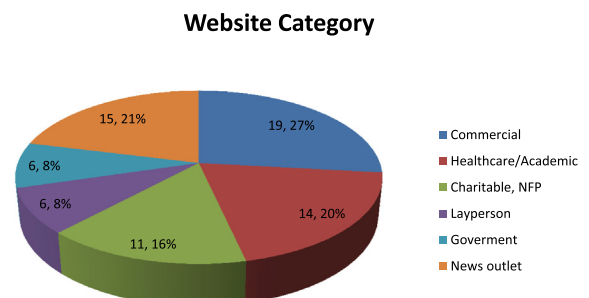82% (n = 58) of the websites were from the United States of

Website Category

Fig. 1. Breakdown of applicable websites by subgroup.