



Evaluating the Quality and Readability of Internet Information on Meningiomas

Fozia Saeed and Ian Anderson

■ **BACKGROUND:** The Internet is a highly powerful resource for patients and provides an extensive amount of information on medical conditions. It is therefore important that the information accessible is accurate, up to date, and at an appropriate comprehensive level for the general public. This article aims to evaluate the quality of patient information on meningiomas.

■ **METHODS:** The term meningioma was searched using the following search engines: Google, Bing, Yahoo, Ask, and AOL. The top 100 meningioma Web sites were analyzed for readability using the Flesch Reading Ease score and the Flesch-Kincaid grade level. The quality of each Web page was assessed with the DISCERN instrument and the Centers for Disease Control and Prevention (CDC) Clear Communication Index (CCI).

■ **RESULTS:** The quality of information on the Internet on meningiomas is highly variable. The overall mean Flesch Reading Ease score was 43.1 (standard deviation = 13.3) and the mean Flesch-Kincaid grade of all the Web sites was 11.2 (standard deviation = 2.3). This finding suggests that the information is on average difficult to read. Only one Web site was at the recommended seventh-grade level and the remainder were above this grade. Only one third of the Web pages had Health On the Net Code of Conduct or The Information Standard certification and were found to be significantly of higher quality: DISCERN ($P = 0.022$) and CDC CCI ($P = 0.027$). More than 50% of the Web sites had significantly poor or average DISCERN scores and only 2 Web sites fulfilled the CDC CCI criteria.

■ **CONCLUSIONS:** It is recommended that clinicians personally research material for their patients to be able to

guide them to reliable and accurate Web sites. It is also encouraged to become Health On the Net Code of Conduct/The Information Standard certified because this may indicate information of high quality. In addition, it is also recommended that authors of existing information assess the quality of their online health information against the CDC CCI criteria.

INTRODUCTION

There has been a marked increase in Internet usage and access in recent years; 86% of households in Great Britain (22.5 million) had home Internet access in 2015.¹ The Internet can be a valuable resource, particularly for patients wanting to know more about medical conditions. Recent statistics show an increase in the use of the Internet to search for health-related information from 18% in 2007 to 48% in 2015 in Great Britain.¹

The Internet is used as a resource for a variety of reasons. Users search for further information regarding signs and symptoms and diagnoses, gaining further insight into conditions, understanding a procedure/operation, or finding support groups.²

However, there are also several shortcomings associated with online information, such as the challenge of regulating the quality of health-related information. A study of existing literature indicates that the quality of online health-related information is highly variable.³⁻⁵ Inaccurate information could have a detrimental effect on the reader, such as building barriers between the physician and patient.^{6,7}

Meningiomas are the most common primary brain tumors and arise from the arachnoid cap cells in the dura.⁸ They are usually benign; however, they can nonetheless result in considerable distress for the patient. It is therefore imperative that

Key words

- Internet information
- Meningioma
- Patient

Abbreviations and Acronyms

- CCI:** Clear Communication Index
CDC: Centers for Disease Control and Prevention
FK: Flesch-Kincaid
FRE: Flesch Reading Ease
HONcode: Health On the Net Code of Conduct
TIS: The Information Standard

Department of Neurosurgery at Leeds General Infirmary, Leeds, United Kingdom

To whom correspondence should be addressed: Fozia Saeed, M.B.B.S., B.Sc. (Hons.)
[E-mail: fozia.s@doctors.org.uk]

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information presently available on the Internet for patients to access is of high standard and is accurate as well as up to date. The readability of the information should also be suitable for lay people. The current recommendation is that patient-related information should be written at the seventh-grade reading level at most.⁹ However, there is evidence to suggest that many health-related Web sites are set higher than this level and patients would therefore find it difficult to comprehend the content.¹⁰⁻¹²

The aim of this study is to assess the quality and readability of existing information relating to meningiomas present on the Internet that can be accessed by any person.

METHODS

We performed an advanced search with the term “meningioma” on 5 popular search engines (Google, Bing, Yahoo, Ask, and AOL) in September 2015 using the exact phrase feature and English-only filters. The top 20 Web sites from each search engine were selected from the initial search and analyzed (Figure 1). Those Web sites duplicated or with content other than written information were excluded. This strategy resulted in 29 Web sites that were first evaluated for authorship and classed as clinician/academic, charity, or unspecified (for those that do not identify authorship).

The quality of each Web page was assessed using validated methods: the DISCERN tool and the Centers for Disease Control and Prevention (CDC) Clear Communication Index (CCI). The DISCERN tool is a 16-item questionnaire developed by the National Health Service Executive Research and Development Programme to primarily help users select and use health-related information of good quality.¹³ Each Web site is scored on a rating scale from 16 to 80 and the higher the score, the higher the quality and reliability. The CDC CCI is a recently developed tool that highlights the intended audience’s needs and provides evidence-based criteria to develop and assess public communication products.¹⁴

The Flesch Reading Ease (FRE) score and Flesch-Kincaid (FK) reading grade level were used to determine readability since they are well-known and commonly used metrics. The FRE score assesses readability on a scale ranging from 0 to 100, where 0 is unreadable and 100 being most readable. It is based on the average number of syllables per word and average number of words per sentence.¹⁵ The FK grade is a popular tool that is calculated using the formula: $0.39 (\text{total words/sentences}) + 11.8 (\text{total syllables/total words}) - 15.59$.¹⁶

In addition, the presence of Health On the Net Code of Conduct (HONcode) certification or The Information Standard (TIS) was also recorded. The HONcode certification is provided to organizations by the Health on the Net Foundation (founded in 1995) and indicates that the organizations meet the quality and reliability standards.¹⁷ TIS is also a certification program, established by the Department of Health, which is awarded to organizations producing evidence-based health care information for the public. To achieve certification, the information offered by the organization is thoroughly assessed for accuracy, clarity, and whether it is up to date and evidence based.¹⁸

Statistical analysis was performed using SPSS Version 18.0 (SPSS Inc., Chicago, Illinois, USA). Mean scores are presented, with standard deviation. The Mann-Whitney U and Kruskal-Wallis H tests were used to determine statistical differences between the groups, set with a significance level of P values <0.05 . The Bland-Altman plot was constructed to measure agreement between the DISCERN and CDC CCI scores.

RESULTS

Of the 100 individual Web pages that were selected for analysis of quality and readability on meningiomas, only 29 were subsequently inspected further because of duplication, irrelevance, and incorrect formats. The Web pages were categorized according to

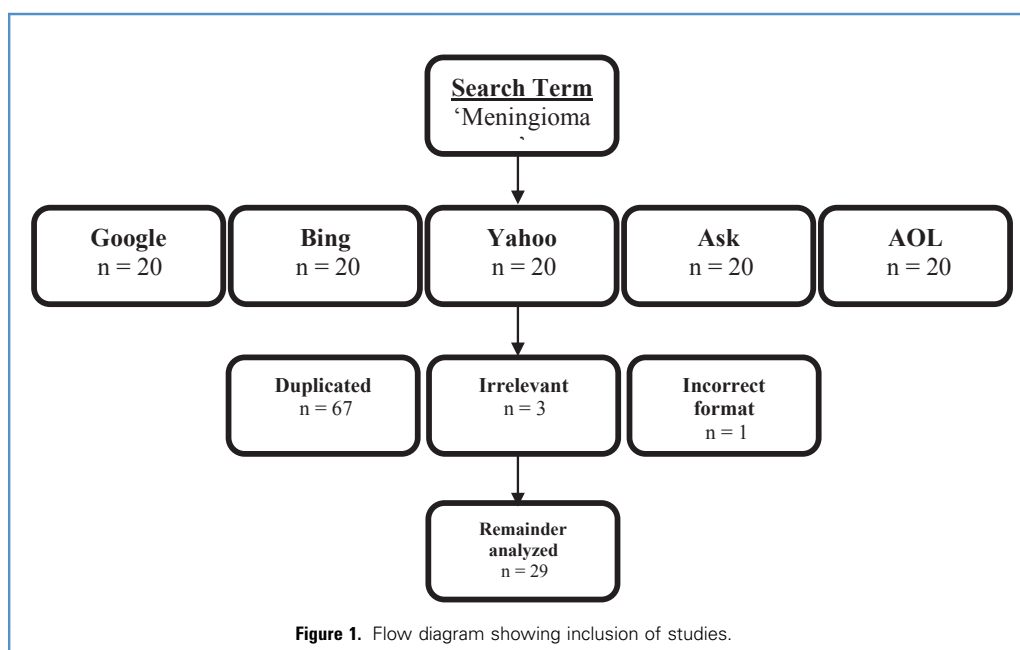


Figure 1. Flow diagram showing inclusion of studies.

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