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Variability of patient spine education by Internet search engine

George M. Ghobrial[a,1], Angud Mehdi[a], Mitchell Maltenfort[b], Ashwini D. Sharan[a], James S. Harrop[a,*]

[a] Department of Neurological Surgery, Thomas Jefferson University Hospital, 909 Walnut Street, 3rd Floor, Philadelphia, USA
[b] Rothman Institute, Department of Orthopedic Surgery, Philadelphia, USA

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ABSTRACT

Background: Patients are increasingly reliant upon the Internet as a primary source of medical information. The educational experience varies by search engine, search term, and changes daily. There are no tools for critical evaluation of spinal surgery websites.
Purpose: To highlight the variability between common search engines for the same search terms. To detect bias, by prevalence of specific kinds of websites for certain spinal disorders. Demonstrate a simple scoring system of spinal disorder website for patient use, to maximize the quality of information exposed to the patient.
Study design: Ten common search terms were used to query three of the most common search engines. The top fifty results of each query were tabulated. A negative binomial regression was performed to highlight the variation across each search engine.
Results: Google was more likely than Bing and Yahoo search engines to return hospital ads ($P = 0.002$) and more likely to return scholarly sites of peer-reviewed lite ($P = 0.003$). Educational web sites, surgical group sites, and online web communities had a significantly higher likelihood of returning on any search, regardless of search engine, or search string ($P = 0.007$). Likewise, professional websites, including hospital run, industry sponsored, legal, and peer-reviewed web pages were less likely to be found on a search overall, regardless of engine and search string ($P = 0.078$).
Conclusion: The Internet is a rapidly growing body of medical information which can serve as a useful tool for patient education. High quality information is readily available, provided that the patient uses a consistent, focused metric for evaluating online spine surgery information, as there is a clear variability in the way search engines present information to the patient.

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1. Introduction

Patients are obtaining a significant amount of their medical education prior to being evaluated by medical personnel. One large survey of orthopedic outpatients shows a heavy reliance on Internet searches for information on patient education [1]. This has particularly accelerated over the last decade due to the information age. The field of spine surgery has experienced this phenomena due to a number of factors. Presently, the patient preferred vessel for public education has been the Internet. In particular, in the field of science and medicine, the rapid availability of medical news, literature via publications, and physician and hospital report cards are easily accessible through Internet searches. New medical devices are heavily advertised online, which can alter patient perception of a disease and heighten expectations of surgery, prior to meeting the surgeon for the first consultation. Given the complexities of the field of spinal surgery, patient education is often driven chiefly by simplified medical education tools found through Internet search engines. The first objective of this manuscript is to characterize the web sites that commonly return from key search terms such as cauda equina, epidural abscess, low back pain, spondylolisthesis, scoliosis, fusion, spinal surgery, sciatica, herniated disk, minimally invasive, laser spine surgery, and spinal cord injury. The goal of characterizing these key search terms is to demonstrate that a particular search term has web browser specific results from variations in search methodology that can lead to substantial bias in the types of web pages that return in the first fifty sites. The first sites that are returned in a browser arguably will have the greatest role in patient education.

Patient interactions with physicians are influenced by preconceived ideas they develop early in their quest for self-education. This is profoundly influenced by the search engine they have chosen. Therefore, a secondary goal in this manuscript is to offer patients a user-friendly method for rating surgery websites that offer information regarding spinal diseases.

* Corresponding author. Tel.: +1 215 955 7000; fax: +1 215 503 7038.
E-mail addresses: georgeghobrial@gmail.com (G.M. Ghobrial), James.harrop@jefferson.edu (J.S. Harrop).
[1] Tel.: +1 215 955 7000; fax: +1 215 955 6565.

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2. Methods

An online Internet search was conducted from September 1st, 2012 until September 30th, 2012 using the Internet search engines Google™ (http://www.google.com), Yahoo™ (http://www.yahoo.com), and Bing™ (http://www.bing.com). A panel of neurosurgeons reviewed and selected common spine terminology and conditions and were frequent inquiries by patients seen on new referrals. Based on this evaluation ten selected terms were chosen which represented a spectrum of spinal diseases. Specifically, the following key terms were individually searched: cauda equina, epidural abscess, low back pain, spondylolisthesis, scoliosis, fusion, spinal surgery, sciatica, herniated disk, minimally invasive, laser spine surgery, and spinal cord injury. This search was in particular carried out by two undergraduate education students without a medical background, similar to the education of many commonly seen patients. The top fifty search results for each individual term were categorized as follows: educational site without advertisements, educational site with advertisements, medicolegal, hospital advertisement, industry, consumer, news, government, and surgical group. One division of web pages encompasses all professional websites that offer support for only a specific pathology, and that was labeled as 'web community'. Peer-reviewed, academic publications were also considered as a separate group.

The top 50 results were categorized only for each search. For each search, the primary link was evaluated for each search return. A page was considered without advertisements if the page directly linked by the search engine did not include any banners or hyperlinks to consumer related products. Advertisements contained on webpages for products unrelated to the subject were included in the study as commercial advertisement. Websites containing banners from industrial, medicolegal, or healthcare consumer websites were considered separately. Web results involving animals were excluded from the study. Repeated webpages in the search were included in the tally based on the number of times they appeared in the top fifty for that particular search.

2.1. Statistical analysis

A negative binomial regression was utilized. All three search engines were independently controlled for in order to compare results of Google, Yahoo, and Bing searches. Log coefficients returned were compared by relative change and expressed as a percentage. A proprietary software package was utilized for statistical analysis ('R' v. 2.15.1 by the R Foundation for Statistical Computing, Vienna, Austria). Statistical significance was defined as a P value of 0.05 or less (confidence interval of 95%).

3. Results

Distribution for the top fifty results of each search parameter are displayed according to search engine (Tables 1–3). Overall, educational sites with and without advertisements, surgical private groups, and online web community (dedicated to a particular healthcare goal) received most of the results irrespective of search engine (Fig. 1).

Controlling for Bing and Yahoo search engines, Google was more likely to return hospital ads ($P = 0.002$) and more likely to return scholarly sites of peer-reviewed literature ($P = 0.003$) than Bing or Yahoo search engines (Table 4).

When controlling for type of search engine, educational web sites, surgical group sites, and online web communities had a significantly higher likelihood of returning on any search, regardless of search engine, or search string ($P = 0.007$). Likewise, professional

Table 1
Google Internet search (http://www.google.com), 9/10/2012.

Search terms	Educational (w/o advertisement)	Educational (w/ advertisements)	Medicolegal	Hospital advertisement	Industry	Consumer	News	.gov	Web community/ organization/academic	Peer-reviewed article	Surgical group	Total
Cauda equina	12	3	3	5	0	0	0	1	15	7	4	50
Epidural abscess	5	3	3	9	0	0	5	0	19	6	0	50
Low back pain	12	5	2	4	0	0	3	0	17	7	0	50
Spondylolisthesis	9	4	0	6	0	0	0	0	6	1	24	50
Scoliosis	14	14	0	0	3	0	3	3	10	1	2	50
Spine fusion	4	4	3	7	1	2	2	2	8	3	14	50
Spinal surgery	12	10	0	1	1	1	2	4	3	1	15	50
Sciatica	10	20	1	2	1	0	0	6	6	1	3	50
Herniated disk	18	13	0	2	2	2	4	2	5	0	2	50
Minimally invasive	4	11	0	0	1	1	6	1	12	3	11	50
Laser spine surgery	4	3	5	3	0	0	7	0	0	0	28	50
Spinal cord injury	11	9	6	1	1	0	4	6	11	0	1	50