International Journal of Pediatric Otorhinolaryngology 76 (2012) 1312–1316

Contents lists available at SciVerse ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: www.elsevier.com/locate/ijporl

Quality of Internet information in pediatric otolaryngology: A comparison of three most referenced websites

Peter G. Volsky [a,1], Cristina M. Baldassari [b,2], Sirisha Mushti [c,3], Craig S. Derkay [d,*]

[a] Department of Otolaryngology, Eastern Virginia Medical School, 600 Gresham Drive, Ste 1100, Norfolk, VA 23507, USA
[b] Pediatric Otolaryngology, Eastern Virginia Medical School Children's Hospital of the King's Daughters, 601 Children's Lane, 2nd Floor, Norfolk, VA 23507, USA
[c] Eastern Virginia Medical School Education & Research Building, 651 Colley Avenue, Norfolk, VA 23507, USA
[d] Department of Otolaryngology, Pediatric Otolaryngology, Eastern Virginia Medical School Children's Hospital of the King's Daughters, 601 Children's Lane, 2nd Floor, Norfolk, VA 23507, USA

ARTICLE INFO

Article history:
Received 3 May 2012
Accepted 26 May 2012
Available online 7 July 2012

Keywords:
Otolaryngology
Pediatrics
Internet
Patient education as topic
Consumer health information
Information services
Benchmarking

ABSTRACT

Objective: Patients commonly refer to Internet health-related information. To date, no quantitative comparison of the accuracy and readability of common diagnoses in Pediatric Otolaryngology exist. Study aims: (1) identify the three most frequently referenced Internet sources; (2) compare the content accuracy and (3) ascertain user-friendliness of each site; (4) inform practitioners and patients of the quality of available information.

Methods: Twenty-four diagnoses in pediatric otolaryngology were entered in Google and the top five URLs for each were ranked. Articles were accessed for each topic in the three most frequently referenced sites. Standard rubrics were developed to include proprietary scores for content, errors, navigability, and validated metrics of readability.

Results: Wikipedia, eMedicine, and NLM/NIH MedlinePlus were the most referenced sources. For content accuracy, eMedicine scored highest (84%; $p < 0.05$) over MedlinePlus (49%) and Wikipedia (46%). The highest incidence of errors and omissions per article was found in Wikipedia (0.98 ± 0.19), twice more than eMedicine (0.42 ± 0.19; $p < 0.05$). Errors were similar between MedlinePlus and both eMedicine and Wikipedia. On ratings for user interface, which incorporated Flesch–Kinkaid Reading Level and Flesch Reading Ease, MedlinePlus was the most user-friendly (4.3 ± 0.29). This was nearly twice that of eMedicine (2.4 ± 0.26) and slightly greater than Wikipedia (3.7 ± 0.3). All differences were significant ($p < 0.05$). There were 7 topics for which articles were not available on MedlinePlus.

Conclusions: Knowledge of the quality of available information on the Internet improves pediatric otolaryngologists' ability to counsel parents. The top web search results for pediatric otolaryngology diagnoses are Wikipedia, MedlinePlus, and eMedicine. Online information varies in quality, with a 46–84% concordance with current textbooks. eMedicine has the most accurate, comprehensive content and fewest errors, but is more challenging to read and navigate. Both Wikipedia and MedlinePlus have lower content accuracy and more errors, however MedlinePlus is simplest of all to read, at a 9th Grade level.

1. Introduction

Health-related information is easily available to anyone with Internet access. Increasingly, patients and their families are using websites to answer questions about their health, and most of the health-related information in online is not reviewed by health professionals. Sites such as Wikipedia have great numbers of users [1]; the ease with which users edit articles is its mainstay of quality-control. Notwithstanding, the large numbers of readers, as well as the belief that the wiki model of editing generates accurate content, has led some to argue that a similar healthcare-specific wiki site may render obsolete the traditional medical peer-review process [1].

Cross-sectional studies of otolaryngology patients reveal that between 20 and 50 percent of them access online information. These numbers appear to be increasing. A 2004 survey by Tassone et al. regarding 535 otolaryngology outpatients at the Royal National Throat Nose and Ear Hospital in London revealed that 64 percent had Internet access, and 18 percent consulted with digital resources prior to their office visits [2]. Among families consulting pediatric otolaryngologists, Internet access rates are higher among

* Corresponding author. Tel.: +1 757 668 9853; fax: +1 757 668 6938.
E-mail addresses: volskypg@evms.edu (P.G. Volsky), cristina.baldassari@chkd.org (C.M. Baldassari), sirisha.ml@gmail.com (S. Mushti), craig.derkay@chkd.org (C.S. Derkay).
[1] Tel.: +1 757 388 6200; fax: +1 757 388 6241.
[2] Tel.: +1 757 668 9853; fax: +1 757 668 6938.
[3] Tel.: +1 757 469 3629.

0165-5876/$ – see front matter © 2012 Elsevier Ireland Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.ijporl.2012.05.026

subjects with similar demographics. Boston et al. reported in 2005 that nearly 50 percent of parents use online sources to find information on their child's otolaryngologic problem [3]. This survey studied 204 parents at Cincinnatti Children's Hospital, 83 percent with Internet access. Forty-three percent of parents accessed Internet information, and two-thirds of these reported that medical decision-making regarding their child was influenced by the knowledge obtained online.

Physicians also use digital resources. A survey by the American Academy of Pediatrics revealed in 2010 that 90 percent of new pediatricians enhance their learning with information technology, and 80 percent use the Internet to obtain health-related information daily [4].

As patients and professional colleagues inform themselves with available Internet sources, the impetus is on the expert to understand the availability and content of Internet information concerning his or her specialty. With a list of pediatric otolaryngology topics in mind, authors of the present study set forth the following aims: (1) identify the three most frequently referenced Internet sources for each topic; (2) compare the accuracy and (3) ascertain user-friendliness of each site; and (4) inform practitioners and patients of the quality of available information.

2. Methods

2.1. Review of the literature

Despite growing awareness that patients use the Internet to educate themselves and support their medical decisions, there have been few organized efforts to parse and critique the state of medical knowledge online. No reviews have been undertaken to identify studies that investigate quality of online information.

To identify existing studies, a review was undertaken by performing a MedLine subject search on "Patient education as topic" limited to titles including "Internet" or "Web." The resulting abstracts were scanned to yield relevant citations (accessed 11/21/11).

2.2. Identification of sources

A list was made of 24 common diagnoses in pediatric otolaryngology (Table 1). Each of these diagnoses was entered as a Google search term (http://www.google.com/), and the top five URLs for each search term were ranked 1–5. A tally of ranks for each URL was recorded. The top three most frequently occurring sites for patient information were chosen (Wikipedia, eMedicine, and NIH/NLM MedLine Plus). These three sites were searched to find articles specific to each of the 24 diagnoses, and accessed during January–February 2011 (P.G.V.), October–November 2011 (C.S.D.), and January 2012 (C.M.B.).

2.3. Scoring

The scoring system included proprietary content rubrics designed by one author (P.G.V.) as well as validated instruments (Flesch–Kinkaid Reading Level and Flesch Reading Ease scores) also used by prior Internet-quality studies [5,6]. The scoring method was approved by all authors. Each topic receives three component scores for content accuracy, errors and omissions, and user interface.

A *Content accuracy score* reflects the essential facts included on each topic as compared to two current otolaryngology textbooks [7,8]. Each source is awarded a total number of points based on its inclusion of the key points listed in textbooks. Included items are as follows:

Table 1
Topics.

Pediatric diagnosis
Acute otitis media
Otitis media with effusion
Chronic serous otitis media
Cholesteatoma
Tympanic membrane perforation
Facial nerve paralysis
Obstructive sleep apnea
Subglottic stenosis
Adenoiditis
Tonisillitis
Recurrent respiratory papillomatosis
Vocal fold immobility/paralysis
Laryngomalacia
Chronic rhinosinusitis
Allergic rhinitis
Cervical lymphadenopathy
Branchial cleft cyst
Thyroglossal duct cyst
Sensorineural hearing loss
Hemangioma
Lymphatic malformation
Epistaxis
Nasal fractures
Ankyloglossia

Twenty-four selected diagnoses in pediatric otolaryngology were considered search terms.

- Key defining features
- Most common causes
- Natural history or prognosis
- Presence or lack of evidence-based medical treatments *
- Presence or lack of evidence-based surgical indications *
- Description of surgery or a hyperlink to such a description
- Therapies not causing benefit or harm or for which evidence is unavailable *
- Therapies known not to work or cause harm *
- Reference score, as a ratio: [Scientific sources (textbooks, articles)/Total sources].

Each of these items is weighed as one point. Items marked with an asterisk (*) also have sub-items specific to each topic that vary in number. Additional points are added for each sub-item listed. The variability in existing knowledge in textbooks accounts for a variable total number of content points per topic. Percentages were calculated to permit site–site comparisons.

The *Errors and omissions score* is an integer tally to which one point is added for wrong or misleading information, as determined by the evaluator.

The *User interface score* is an absolute number tally. Articles earn points for the following:

- If the title exactly matches the diagnosis (i.e. "*subglottic stenosis*" *versus* "*airway stenosis*")
- If there are no other articles for that diagnosis on the source website (*i.e., a site may have numerous articles on "acute otitis media"*)
- A lower Flesch–Kincaid grade level: (+2 for <7; +1 for <12; 0 for >12).
- A higher Flesch Reading Ease: (+2 for >65; +1 for 31–64; 0 for <30)
- Hyperlinks to relevant topics (+2); Hyperlinks not especially helpful (+1); No links (0)

All authors scored all topics to reduce bias introduced by a single observer. Flesch–Kinkaid totals were computed once for each article using Microsoft® Office Word 2007, by copying the full