

1 Collaborative authoring: A case study of a public wiki as a resource to keep systematic reviews up to date

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Abstract

Background: Systematic reviews are recognized as the most effective way to summarize research evidence. However, they are limited by the time and effort required to keep them up-to-date. Wikis present a unique opportunity to facilitate collaboration among many authors at potentially reduced costs. The purpose of this study was to examine the use of a wiki as an online collaborative tool for updating a peer-reviewed systematic review.

Methods: An existing peer-reviewed systematic review on asynchronous telehealth was published on an open publicly available wiki. Log file analysis, user questionnaires and content analysis were used to collect descriptive and evaluative data on the use of the site from June 9, 2009 to April 10, 2010.

Results: During the 10-month study period, there were a total of 1,222 visits to the site, 3,996 page views and 875 unique visitors from around the globe. Five unique visitors (0.6% of the total number of visitors) submitted a total of six contributions to the site: three contributions were made to the article itself, and three to the discussion pages. None of the contributions substantially enhanced the evidence base of the systematic review. The project was challenged by a barrage of spam messages, fake accounts, and the lack of incentives for potential contributors to consider collaborative improvement of peer-reviewed journals as a valuable undertaking in terms of career progression.

Interpretations: Despite being easy-to-use, free and powerful means to edit information, wikis currently appear to have limited value as resources to keep research evidence current. Controversial topics and incentives for researchers and other content experts might motivate greater participation in online collaborative efforts to keep scientific knowledge up to date.

2Introduction

Systematic reviews have become the most effective ways to identify, select, assess and synthesize all original research evidence relevant to a specific question. Most systematic reviews have finite lifespans, with a median survival (time from publication until availability of significant new information that potentially changes effect size or direction of the review) of 5.5 years from the time of publication; it has been estimated that for 23% of systematic reviews, significant new information is available within 2 years of publication [1]. Despite the need to keep reviews current, only 17.7% of systematic reviews seem to be cited as updated versions of previously published reviews [1, 2].

The Internet presents a unique opportunity to explore new ways to update and publish academic research due to its open, transparent nature and the availability of free software for online collaboration. Wikis, in particular, are efficient tools for co-creating, maintaining and making widely available repositories of knowledge. In general, a wiki allows anyone to easily add to, edit or delete the content of a website. The wiki application keeps track of all changes and offers the ability to acknowledge author contributions. It has been suggested that some of the benefits of using a wiki for collaborative authoring include the ability to track authorship, monitor the development of an article and reduce conflicts of interest [3].

Wikis are used very successfully as highly efficient tools to co-create and maintain large amounts of general interest content. A case in point is Wikipedia, the largest encyclopedia in the world. With over 3.5 million pages of articles in English alone, each of which is edited 19 times on average, and over 13 million registered users

[4], this free resource overtook all other encyclopedias in size [5] and possibly even the Encyclopedia Britannica in quality, in less than 5 years [6].

Wikis have also been used effectively to create, edit and maintain large pools of health-related knowledge in practically all areas [7, 8]. Most of the efforts, however, appear to be led by lay members of the public or open to them, as a means to promote easy access to accurate, free and up to date information on specific diseases or subjects to anyone interested, anywhere in the world [8, 9]. To the best of our knowledge, however, there have been no published efforts to explore the role that wikis could play in relation to updating and maintaining the contents of peer-reviewed systematic reviews of health interventions. This study was designed to begin to address this gap.

The purpose of this study was to examine the use of a wiki as an online collaborative tool for updating a peer-reviewed systematic review. With support from Open Medicine and the Canadian Agency for Drugs and Technologies in Health (CADTH), a peer-reviewed systematic review was adapted for publication on an open, public wiki. This article describes the characteristics of the users, their use of the site, and the nature, quality and quantity of the contributions, as well as the ‘buzz’ that accumulated in the blogosphere during the study period.

3Methods

The open, public wiki was created and made available through the Open Medicine web site on June 9, 2009, under the name *Open Medicine wiki* (http://wikisr.openmedicine.ca/index.php/Main_Page).

The wiki was populated with a pre-existing, peer-reviewed systematic review on asynchronous telehealth by Deshpande et al [10] that was initially published by CADTH in print and online form in January 2008, following extensive peer-review [11]. In preparation for its publication format on the *Open Medicine wiki*, the review underwent a second round of peer review by the editorial board of Open Medicine.

The *Open Medicine wiki* utilized the open-source platform developed by Mediawiki, which also powers Wikipedia, to create a viewing and navigating experience that would be familiar to users of the site (Figure 1). The wiki was hosted and administered by the Centre for Global eHealth Innovation, a joint research initiative of the University of Toronto and University Health Network in Toronto, but it was branded with the Open Medicine logo and linked to the Open Medicine website.

Initially, the *Open Medicine wiki* was launched as a public ‘unrestricted’ wiki that was open for anyone to view, add, change or delete content and join. Registration was not required to contribute or modify content on the site, in an effort to lower any perceived barriers to participation. Due to extensive spamming, two spam filters ReCAPTCHA and SpamBlacklist were installed on the site on June 24th, 2009, which served to effectively prevent further inappropriate contributions to the site. As of July 21st, 2009, anyone interested in contributing or modifying content on the site was required to register with a unique log-in ID and password, answer a few basic demographic questions (e.g. age, gender, country of domicile, experience with wikis), and a competing interest statement. Registered users also had access to the ‘talk’ page of each site page, which served as an open forum for dialogue and interaction with other users of the site. There was no pre-screening of edits or contributions to the wiki. The only changes to the content of the site

made by the administration team were ‘roll-backs’ to previous versions when the site was spammed with inappropriate and unrelated content.

The *Open Medicine wiki* was promoted by Open Medicine journal in two eBulletins and a Rapid Article Response that were published on the Open Medicine site and distributed to members of their e-mailing list, as well as by the Canadian Society of Telehealth (now known as the Canadian Telehealth Forum) in an eBulletin published on their site and distributed to members of their e-mailing list and through personal communication with their Research Committee.

1Data collection

A mixture of quantitative and qualitative methods [12] was used to collect descriptive and evaluative data on the use of the site from June 9, 2009 to April 10, 2010.

Google Analytics, a service created by Google to measure various metrics related to web site usage, was used to summarize log file data on how the wiki was used. The following parameters were evaluated:

- Number of site visits (based on unique IP address)
- Number of new visits (first visit from unique IP address)
- Number of unique site visitors (visits from unique IP address)
- Country of domicile of site visitors (where Internet Service Provider is registered)
- Number of total and average page views (specific web site page)
- Source of traffic (referring web site)
- Direct traffic (visitors who typed in the URL of the site in their browser, or accessed

the site from a browser bookmark, link in email or documents)

- Bounce rate (frequency of times a visitor lands on the first page and then exits the site)

These usage statistics were collected from any visitor to the site regardless of whether they registered to edit the wiki or not.

Visitors who choose to edit the wiki were required to complete a brief online questionnaire as part of the registration process. This questionnaire collected information on:

- Gender and age
- Country of domicile (where the visitor was living at the time of site access)
- Experience using wikis (have you ever obtained information from or contributed content to a wiki)
- Referral source (e.g. journal, professional society, browser, accidentally, word of mouth)
- Institutional affiliation
- Role (e.g. health care worker, researcher, administrator, patient, public etc)
- Competing interests (e.g. employment, personal or financial)

Content analysis was used to evaluate and describe the nature and quantity of contributions or modifications to the content of the site, including messages posted to the site 'talk' pages, as well as the relevant talk in the 'blogosphere', which was limited to sites (n=55) from which individuals were referred to the *Open Medicine* wiki.

4Results

During the 10-month study period, there were a total of 1,222 visits to the site, 3,996 page views and 875 unique visitors. The majority of site visits occurred during the first two months, and then the traffic steadily declined. The average number of page views per visitor was 3.27, and the bounce rate was 52.0%.

The 1,222 visits to the site came from 66 different countries. Ten countries generated 87.2% of the visits, with 72.2% originating in Canada or the USA (Table 1). Similar proportions of visits came from referring sites (40.4%) and direct traffic (39.4%). A small percentage of traffic came from search engines (20%) (Figure 2).

In total, there were 55 unique referring sites (e.g. websites that included a link to the *Open Medicine wiki*). The Open Medicine website was responsible for nearly 50% of the referred traffic: 167 referrals originated from a link within the article on the Open Medicine website and 63 from the Open Medicine blog. Of the top ten referring websites, six were blogs.

1Site Users

In total there were 61 user accounts; however, only 13 were created by ‘genuine’ users. The remaining 21 accounts were deemed to be ‘fake’ accounts created by either automated scripts or individuals entering malicious information that was either false or nonsensical. An example of a ‘fake’ or fabricated account by user “Njsskannipq” is included in Figure 3.

Of the 13 genuine accounts, five were created by members of the project team and eight were created by non-team members (one individual created two separate accounts).

Only four of the seven unique non-team members who registered with the site completed the registration questionnaire (three registered prior to the addition of the survey). Of these four, three were male, three were Canadian, all were between 30 to 60 years old, all had previously used a wiki for information, three were affiliated with a university and two were health researchers, one was a health administrator and one was a health practitioner. Only one had previously contributed content to a wiki, and only one reported having a conflict of interest.

2Site contributions

Of the 875 unique site visitors, five individuals made a total of six contributions to the site (0.57% of the total number of visitors to the site).

There were three contributions to the article itself:

- A sentence about the function of asynchronous telehealth was added to the abstract;
- Competing interests were added to the author declaration section; and
- A grammatical change was made to the content in the competing interests section.

Two posts were added to the article's 'talk' page. One contributor posed the question about the existence of safeguards to protect patient privacy, which was answered by the project team. The second contributor suggested expanding the definition of telehealth used in the article to include online support communities for patients and health care professionals. Neither of the two posts generated responses or commentary from other users of the site. Lastly, one post requesting help with the registration process was added to the site's help page.

3 Buzz in the blogosphere

This project generated some comments in the blogosphere. In general, the blog commentary about the *Open Medicine wiki* was positive, but tempered with some skepticism. The positive blog postings applauded the initiative and the door it opened for further experimentation and innovation in the field of academic publishing. Some of the most representative comments were:

“ The technophile blurry-eyed visionary in me is very impressed. Congratulations to this sister discipline [commenter was from law] for having the courage and foresight to lead the way” Blogger 1

“... a simple idea with significant consequences. It should enable risk-free experimentation with all sorts of web 2.0 innovations, social networking, and collaborative research and writing. Some will fail to add value. That doesn't matter. The point is not that all experiments will succeed but that this simple idea frees us to experiment” Blogger 2

“It will be interesting to see how successful this approach is and to speculate about how the potential changes from this publishing model will play out in the future” Blogger 3

Negative blog posts revolved around concerns about threats to the quality of the article if non-experts are allowed to contribute to it and the sustainability of such an initiative.

“The law prof, writer, editor and publisher in me is writhing at the fate the could befall an article at the hands of the public, even a public that has to register first” Blogger 1

“I think the wiki is worth a try, but I worry about its staying power. I often have trouble getting docs to use PubMed properly, so how can I convince them to build a wiki?”

Blogger 4

5Discussion

To our knowledge this is the first attempt to examine the use of an open, publicly available wiki as a tool to engage the academic and clinical communities, as well as the public, in the collaborative updating process for a peer-reviewed systematic review. Our findings indicate that this initiative failed to add value to the body of evidence on asynchronous telehealth. While the wiki attracted 875 unique visitors from around the globe, less than 1% contributed content to the article and none of the contributions substantially improved the nature or extent of evidence presented in the article. However, this initiative succeeded in stimulating dialogue about novel formats of academic publishing, as evidenced by the commentary that accumulated in the blogosphere. It also provided a lesson in *what does not work*, and in doing so has alerted us to important contextual factors that may hinder the role of crowd-sourcing through wikis as a means to keep science up to date.

Although there is a wide spectrum of activity, most online communities have a handful of dedicated contributors and a much larger number of lurkers (people who read but do not post). The ratio of posters-to-lurkers in mailing lists and message boards is estimated to be on average 100:1 [13]. The main reasons for lurking in these online communities include: not needing to post or feeling as though one has nothing to contribute, needing to find out more about the group before participating, thinking that they were being helpful by not posting, not understanding how the software operates, and

not liking the dynamics of the community [14]. In the case of Wikipedia, there has been much debate concerning whether its success is due to “the power of the few or the wisdom of the crowd” [15, 16]. However, research suggests that similar to other online communities a small proportion of editors account for most of the work done and valued added [16-18].

The poor levels of use of the wiki in the present study could not be explained by the absence of new evidence, as there were at least six articles just on tele-dermatology published between the third week of November of 2006 [19-24] when the original search of the literature was performed and the end of the data collection period in April of 2010. Such low levels of activity on the wiki could not be explained either by low interest in asynchronous telehealth amongst potential contributors because of the targeted efforts made to increase awareness about its existence among hundreds of specialist members of the Canadian Society of Telehealth. Although possible, lack of experience with the use of wikis could also be ruled out as an explanation for the dearth of updates made to the review, as more than 800 people visited the site, where they could find instructions on how to edit the information available. A more plausible reason is the lack of incentives for academics and clinicians to invest time and effort in updating a review through a wiki. This kind of work does not count towards publications, grants or any other type of currency for career advancement.

It has been suggested that in order for wikis to be a viable model for collaborative publishing in academia, measures and policies are required to recognize author contributions [25]. Two relevant examples of novel strategies to recognize contributions to wikis are WikiGenes (<http://www.wikigenes.org/>), a knowledge resource for the life

sciences and OPIMEC (<http://www.opimec.org/>), an observatory of innovative practices in complex, chronic disease management. In WikiGenes, authorship tracking technology is used to link contributions unambiguously to authors [25]. In addition, users can use a reputation system to rate each other's contributions. In the OPIMEC initiative, a wiki was to create a book on polypathology within the span of one year, with volunteer contributors from all over the world [26]. Lead contributors produced the first version of each chapter, reviewed volunteer contributions received during a four month period, edited the final version and credited contributors using a contributorship model [27].

Future research should examine whether these and other strategies to recognize author contributions could improve the viability of wikis in academic publishing. Whether this is the case could be easily explored through the replication of the current experiment using a systematic review on controversial interventions for a highly prevalent condition, with a rapidly growing body of research, and whose conclusions could have an important impact on a large number of health professional, academic, policy and corporate groups. By raising the stakes in this way and by incorporating strategies to recognize contributions, it might be possible to establish whether wikis could in fact be valuable resources to keep health knowledge up to date, or tools whose time has yet to come.

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Competing Interests

There are no competing interests.

Author Contributions

ARJ and AD conceived the project. All authors contributed to the design of the project. JLB and LS implemented the project, monitored the wiki, and collected the data. JLB analyzed the data and wrote the first draft of the manuscript. All authors contributed to the manuscript and approved the final version. JLB is guarantor.

Figure 1: Screen shot of article home page



Table 1: Geographic source of site traffic

Country	Site visits
1. Canada	636 (52.0%)
2. USA	237 (19.4%)
3. UK	50 (4.1%)
4. Australia	36 (2.9%)
5. Brazil	25 (2.0%)
6. Spain	21 (1.7%)

7. Argentina	17 (1.4%)
8. Germany	15 (1.2%)
9. Netherlands	14 (1.1%)
10. India	14 (1.1%)

Figure 2: Traffic source

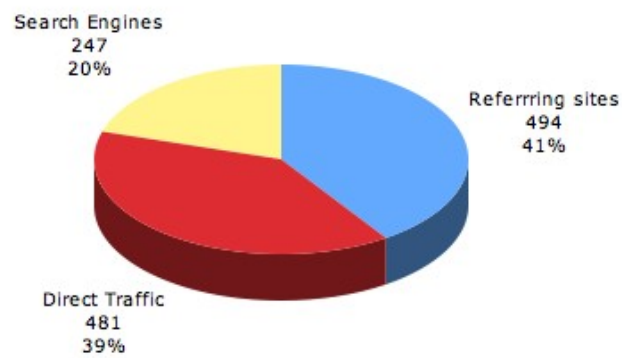


Figure 3: Example of a ‘fake’ account profile



References

1. Shojania KG, Sampson M, Ansari, MT, Ji J, Doucette S, Moher D. How quickly do systematic reviews go out of date? A survival analysis. *Ann Intern Med.* 2007; 147(4):224-33.
2. Moher D, Tetzlaff J, Tricco AG, Sampson M, Altman DG. Epidemiology and reporting characteristics of systematic reviews. *PLoS Med.* 2007;4(3):e78.
3. Schmidt J. Flexibility in wiki publishing: author desires, peer review and citation. *Academic Publishing Wiki* 2005 [cited 2011 April 5]; Available from: http://academia.wikia.com/wiki/Flexibility_in_wiki_publishing:_author_desires,_peer_review_and_citation.
4. Wikipedia.com. Statistics from Wikipedia, the free encyclopedia. 2011 [cited 2011 April 4]; Available from: <http://en.wikipedia.org/wiki/Special:Statistics>.
5. Wikipedia.com. Wikipedia: Size comparisons. 2011 [cited 2011 April 4]; Available from: http://en.wikipedia.org/wiki/Wikipedia:Size_comparisons#Comparison_of_encyclopedias.
6. Giles J. Internet encyclopaedias go head to head. *Nature.* 2005;438(7070):900-1.
7. Mesko B. Medical wikis: the future of medicine? 2007 [cited 2011 April 4]; Available from: <http://sciencerooll.com/2007/03/27/medical-wikis-the-future-of-medicine/>.
8. Laurent MR, Vickers TJ. Seeking health information online: Does Wikipedia matter? *JAMA.* 2009;16(4):471-9.
9. Rothman D. List of Medical Wikis. 2009 [cited 2011 April 4]; Available from: <http://davidrothman.net/list-of-medical-wikis/>.
10. Deshpande A, Khoja S, Lorca J, McKibbin A, Rizo C, Husereau D, Jadad AR. Asynchronous telehealth: A scoping review of analytic studies. *Open Med.* 2009; 3(2):e69-91.
11. Deshpande A, Khoja S, Lorca J, McKibbin A, Rizo C, Jadad AR. Asynchronous telehealth: Systematic review of analytic studies and environmental scan of relevant initiatives [Technology Report No.101]. 2008; Canadian Agency for Drugs and Technologies in Health: Ottawa.
12. Creswell JW. Research design: Qualitative, quantitative and mixed method approaches. 2003; California: Sage Publications.
13. Nonnecke B, Preece J. Lurker demographics: Counting the silent. In SIGCHI Conference on Human Factors in Computing Systems 2000; The Hague: ACM Press.
14. Preece J, Nonnecke B, Andrews D. The top five reasons for lurking: Improving community experiences for everyone. *Comput Human Behav.* 2004;20(2):201-223.
15. Panciera K, Halfaker A, Terveen L. Wikipedians are born, not made. *Proc ACM Group Conference.* 2009; Florida: ACM Press
16. Kittur A, Chi E, Pendleton BA, Suh B, Mytkowicz. Power of the few vs. wisdom of the crowd: Wikipedia and the rise of the Bourgeoisie. *Proc ACM Alt CHI Conference.* 2007; ACM Press.

17. Kittur A, Kraut RE. Harnessing the wisdom of crowds in Wikipedia: Quality through coordination. Proc ACM Conference on Computer Supported Cooperative Work. 2008; San Diego: ACM Press.
18. Priedhorsky R, Chen J, Lam SK, Panciera DL, Terveen L, Riedl J. Creating, destroying and restoring value in Wikipedia. Proc ACM Group Conference. 2007; New York: ACM Press.
19. Verma M, Raman R, Mohan RE. Application of tele-ophthalmology in remote diagnosis and management of adnexal and orbital diseases. Indian J Ophthalmol, 2009;57(5):381-4.
20. Heffner VA, Lyon VB, Brosseau DC, Holland KE, Yen K. Store-and-forward teledermatology versus in-person visits: A comparison in pediatric teledermatology clinic. J Am Acad Dermatol. 2009;60(6):956-61.
21. Edison KE, Ward DS, Dyer JA, Lane W, Chance L, Hicks LL. Diagnosis, diagnostic confidence, and management concordance in live-interactive and store-and-forward teledermatology compared to in-person examination. Telemed J E Health. 2008;14(9):889-95.
22. Fabbrocini G, Balato A, Rescigno O, Mariano M, Scalvenzi M, Brunetti B. Telediagnosis and face-to-face diagnosis reliably for melanocytic and non-melanocytic 'pink' lesions. J Eur Acad Dermatol Venereol. 2008;22:229-34.
23. Ferrandiz L, Moreno-Ramirez D, Nieto-Garcia A, Moreno-Alvarez P, Galdeano R, Bidegain E, et al. Teledermatology-based presurgical management for nonmelanoma skin cancer: a pilot study. Dermatol Surg, 2007;33(9):1092-8.
24. Pak H, Triplett CA, Lindquist JH, Grambow SC, Whited JD. Store-and-forward teledermatology results in similar clinical outcomes to conventional clinic-based care. J Telemed Telecare. 2007;13(1):26-30.
25. Hoffmann R. A wiki for the life sciences where authorship matters. Nat Genet, 2008;40(9):1047-51.
26. Jadad AR, Cabrera A, Martos F, Smith R, Lyons RF. When people live with multiple chronic diseases: a collaborative approach to an emerging global challenge. 2010; Granada: Andalusian School of Public Health.
27. Smith R. Authorship is dying: long live contributorship. BMJ. 1997; 315(7110): 696.