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PERSPECTIVE

FOAMSearch.net: A custom search engine for emergency medicine and critical care

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Abstract

The number of online resources read by and pertinent to clinicians has increased dramatically. However, most healthcare professionals still use mainstream search engines as their primary port of entry to the resources on the Internet. These search engines use algorithms that do not make it easy to find clinician-oriented resources. FOAMSearch, a custom search engine (CSE), was developed to find relevant, high-quality online resources for emergency medicine and critical care (EMCC) clinicians. Using Google™ algorithms, it searches a vetted list of >300 blogs, podcasts, wikis, knowledge translation tools, clinical decision support tools and medical journals. Utilisation has increased progressively to >3000 users/month since its launch in 2011. Further study of the role of CSEs to find medical resources is needed, and it might be possible to develop similar CSEs for other areas of medicine.

Key words: *custom search engine, emergency medicine, medical education, search engine.*

Introduction

The medical and scientific literature are undergoing a rapid expansion¹ and educational resources are becoming ubiquitous online.² This is especially true in the areas of emergency medicine and critical care (EMCC), where 'Free Open Access Meducation' (FOAM) resources are being produced by a growing online community.^{2,3}

Although many of these resources provide useful content, it is often difficult to find them because most search engines (e.g. Google™ or Bing™) are optimised for the lay-public rather than for healthcare practitioners. Google Scholar™ is a search engine that focuses more specifically on scholarly literature. Although this is helpful for finding literature published in journals, it does not index many novel medical educational resources such as wikis, blogs, podcasts, clinical decision support resources (e.g. eMedicine) and other targeted second-order educational resources, which learners are increasingly using during their training.^{4,5} Additionally, Google

Scholar™ results are often behind paywalls that clinicians might or might not have access to. Blitter (<http://blitter.tripdatabase.com>) is a search engine of social media resources; however, it does not include resources published in relevant medical journals. Because of these problems, finding the most relevant medical resource can be akin to finding a needle in the proverbial haystack.

Since 2006, it has been possible to create custom search engines (CSEs) that search only specific content using Google's proprietary algorithms (<https://www.google.com/cse/>). However, to our knowledge, this technology has not been used to develop a customised search for particular medical specialties. This innovation outlines the creation of a CSE that can be used to help clinicians find vetted EMCC online resources.

Developing a custom search engine

A CSE called FOAMSearch (formerly GoogleFOAM) was created to curate online educational resources for EMCC practitioners and hosted at <http://FOAMSearch.net>. A list of websites that include both medical education resources and medical journals of relevance to EMCC learners and practitioners was developed using a previously described methodology² that included a prospective snowball sampling technique (2002–2013) and a Boolean search in November 2013 using the terms: ('emergency medicine' OR 'critical care' OR 'intensive

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TABLE 1. Types and examples of FOAM resources included in the FOAMSearch.net CSE

Type of digital resource	Examples of FOAM resources	Definition of digital resource
Blogs	Life in the Fast Lane Academic Life in Emergency Medicine	A primarily text-based website used to publish information in periodic posts
Podcasts	EMCrit The Skeptic's Guide to Emergency Medicine	Audio recordings that are published periodically
Screencasts (video podcasts, vodcasts)	Emergency Medicine Ireland Emergency ECG Video of the Week	Videos with embedded audio that are published periodically
Knowledge translation tools	TheNNT BestBETs	Evidence-based medicine websites that summarise the academic literature
Clinical decision support systems	MDCalc	Calculators for formulas and decision rules
Wikis	WikEM WikiTox ECGPaedia	A website that can be openly edited by end-users

CSE, custom search engine; FOAM, Free Open Access Medication.

care') AND (podcast OR blog). A website was included in the CSE if it contained predominantly original content, its authors were EMCC educators with listed credentials and it was publicly endorsed by another member of the FOAM community through a personal communication. Additional websites that met the criteria were added manually by the primary author (TR) as they were discovered.

Initially, a convenience sample of medical journals was incorporated into the CSE. These journals were selected because their integration was technically simple. They cover fields including general medicine (i.e. *British Medical Journal*, *Canadian Medical Association Journal*), emergency medicine (EM) (i.e. *Annals of Emergency Medicine*, *Academic Emergency Medicine*) and critical care (i.e. *Critical Care Medicine*, *CHEST*). More journals are being added regularly, with a goal of including the top five 'medicine, general and internal' journals and all 'critical care' and 'emergency medicine' journals published in English and indexed in the 2012 Journal Citation Report.⁶

Use of a custom search engine

The FOAMSearch CSE was launched in 2011 and has been well received by the EMCC community. Since its inception in 2011, utilisation has increased steadily to over 3000 users per month and been endorsed on the popular EM:RAP podcast series (<https://www.emrap.org/episode/2013/november/bonusthelin>) and Academ-

ic Life in Emergency Medicine blog (<http://academiclifeinem.com/herospotlight-dr-todd-raine/>).

Using the described methodology, 300 EMCC websites have been indexed as of 1 February 2014. The complete list is available on the website (<http://FOAMSearch.net/website-list/>). The types of websites that were included are described in Table 1. The author (TR) continues to work towards the goal of indexing the specified journals.

Discussion

The use of a CSE addresses three identified problems. First, with the dramatic increase in published literature, information overload is an increasingly prevalent problem for EM clinicians.^{1,7} We feel that this innovative educational product will advance medical education by making it easier and faster to find quality resources appropriate for healthcare practitioners.

Second, clinicians might or might not have access to subscription-based clinical decision support services (e.g. UpToDate.com) at their institutions. It has been found that this access decreases dramatically for practitioners not affiliated with medical schools or universities.⁷ The inclusion of non-traditional, open-access educational resources might decrease this disparity in information access between practitioners in high and low resource settings by decreasing the reliance on for-profit, subscription-based resources.

Finally, the complexity of searching the medical literature has been found to inhibit physicians' ability to find quality resources.⁸ To the end user, using a CSE is as easy as using general search engines such as Google and Bing. It requires no additional training and the vetting process might improve the quality of the resources that are found. Curated repositories have been found to enhance both the speed and accuracy of information retrieved by clinicians at the point-of-care in other contexts.⁹

Further study is needed to determine the extent to which CSEs are able to improve the speed and quality of search results. Studies comparing learners and clinicians' ability to respond to relevant clinical questions quickly and accurately using CSEs *versus* traditional search engines would provide more robust evidence for their value. If benefits are shown, CSEs could be developed for other specialties of medicine.

With ongoing development, FOAMSearch will continue to improve. It can be argued that the described vetting process is not sufficiently robust to exclude questionable resources. Several authors (BT, TMC, ML) are developing quality assessment instruments for online educational resources that could be used to improve the search results. Although much of the content found by FOAMSearch is open access, this content is not prioritised. The original FOAMSearch designer (TR) is working to optimise the FOAMSearch

algorithms to preferentially list websites with open-access content higher. Although technical limitations continue to prevent the robust inclusion of more medical journals, this remains a priority with the FOAMSearch group. With these enhancements, FOAMSearch will increasingly return specific, high-quality, open-access publications that are relevant to EMCC clinicians.

Conclusion

FOAMSearch is an educational innovation that curates FOAM and medical journals for EMCC practitioners. This innovative CSE holds great promise in helping new generations of emergency physicians to find trusted resources and might be applied for the same purpose in other fields of medicine.

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Author contributions

TR designed the innovation, collected the data, and contributed to the

analysis and interpretation. TR, BT and TMC drafted the article and contributed to the analysis and interpretation of the data. All authors revised the article critically for important intellectual content and approved the final version to be published.

Competing interests

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