Journal of Clinical Epidemiology 88 (2017) 148–153

Journal of Clinical Epidemiology

Testing the effectiveness of simplified search strategies for updating systematic reviews

Maureen Rice[a,b], Muhammad Usman Ali[a,b], Donna Fitzpatrick-Lewis[a,c], Meghan Kenny[a,b], Parminder Raina[a,b], Diana Sherifali[a,c,*]

[a]*McMaster Evidence Review and Synthesis Centre, McMaster University, 1280 Main St. W., McMaster Innovation Park, Room 207A, Hamilton, Ontario L8S 4K1, Canada*

[b]*Department of Health Research Methods, Evidence and Impact, Faculty of Health Sciences, McMaster University, Hamilton, Ontario L8L 2X2, Canada*

[c]*School of Nursing, Faculty of Health Sciences, McMaster University, Health Sciences Centre Room HSC-3N25F, 1280 Main Street West, Hamilton, Ontario L8S 4K1, Canada*

Accepted 5 June 2017; Published online 16 June 2017

Abstract

Objective: The objective of the study was to test the overall effectiveness of a simplified search strategy (SSS) for updating systematic reviews.

Study Design and Methods: We identified nine systematic reviews undertaken by our research group for which both comprehensive and SSS updates were performed. Three relevant performance measures were estimated, that is, sensitivity, precision, and number needed to read (NNR).

Results: The update reference searches for all nine included systematic reviews identified a total of 55,099 citations that were screened resulting in final inclusion of 163 randomized controlled trials. As compared with reference search, the SSS resulted in 8,239 hits and had a median sensitivity of 83.3%, while precision and NNR were 4.5 times better. During analysis, we found that the SSS performed better for clinically focused topics, with a median sensitivity of 100% and precision and NNR 6 times better than for the reference searches. For broader topics, the sensitivity of the SSS was 80% while precision and NNR were 5.4 times better compared with reference search.

Conclusion: SSS performed well for clinically focused topics and, with a median sensitivity of 100%, could be a viable alternative to a conventional comprehensive search strategy for updating this type of systematic reviews particularly considering the budget constraints and the volume of new literature being published. For broader topics, 80% sensitivity is likely to be considered too low for a systematic review update in most cases, although it might be acceptable if updating a scoping or rapid review.

Keywords: Systematic reviews; Search strategy; Updating; Effective

1. Introduction

One of the hallmarks of traditional systematic reviews is a thorough, sometimes exhaustive, search. This is done primarily to minimize the possibility of missing important studies and to limit publication bias. There is, however, a significant tradeoff between recall (sensitivity) and precision resulting in many searches with very large numbers of irrelevant citations. This is particularly true as systematic reviews in published health literature have spread from their origins in clinically focused topics (primarily effectiveness of specific disease interventions/treatment based) to more complex or broader health and social topics such as knowledge translation, health care access, behavior or lifestyle that are characterized by imprecise terminology, and are not well indexed in most medical databases.

At the same time, there has been a rapid expansion in the volume of health literature. In the case of Medline, the number of new citations indexed increased from 442,000 in 2000 to 765,850 in 2014 [1]. The low precision of systematic review searching combined with constraints in research funding has become a significant barrier to maintaining updated systematic reviews. In a 2012 editorial, the Cochrane Library Oversight Committee noted that "[a]s the Library is cumulative the total number of reviews is increasing, but the proportion that are up to date (updated within the past 2 years) is steadily declining-from 39.8% in 2009 to 35.8% in June 2012" [2]. Unsurprisingly, there has been a growing interest in developing methods of reducing the resources needed to update existing systematic reviews, by reducing the screening burden while still maintaining a high level of recall [3–5].

Conflict of interest: None.

* Corresponding author. Tel.: 905-525-9140 ext. 21435.
E-mail address: dsherif@mcmaster.ca (D. Sherifali).

http://dx.doi.org/10.1016/j.jclinepi.2017.06.005

What is new?

Key findings

- Sensitivity of 100% and number needed to read with the simplified search strategy for clinically focused topics were lower than the reference searches Sensitivity of 80% and number needed to read with the simplified search strategy for complex or broad topics were lower than the reference searches.

What this adds to what was known?

- This searching method works well for clinically-based topic literature updates.

What is the implication and what should change now?

- For the complex topics the decision to use this search strategy will need to be decided on a review by review basis.

In 2008, Sampson et al. published a paper testing surveillance search techniques intended to identify the need to update systematic reviews [6]. A search algorithm using a simplified subject search developed by an experienced librarian and limited using Medline's clinical queries combined with PubMed's related articles search (now "similar articles") proved to be the most effective combination in terms of recall and reduced screening burden. Although Sampson et al. only tested their strategy for signals that an update was necessary, the performance of the strategy suggests that it might be a viable strategy for actually updating existing systematic reviews and it has been used for that purpose [3,7]. The objective of this exploratory study was to test the effectiveness of a simplified search strategy based on the approach taken by Sampson et al. for updating systematic reviews.

2. Methods

We identified nine systematic review updates undertaken by our research group (either as the McMaster Evidence-based Review Center or the McMaster Evidence Review Synthesis Centre) in which the update search was performed by the same experienced medical research librarian (M.R.) and in which new, relevant randomized controlled trials (RCTs) were added to the original. These included both updates of systematic reviews originally undertaken by either United States Preventive Services Task Force (USPSTF) or the Cochrane Collaboration, or of our own, de novo reviews (updates of our own work ($n = 4$)—tinnitus [8], colorectal cancer screening [9], smoking prevention and cessation [10], adult obesity prevention [11]) (updates of others ($n = 5$)—prostate cancer screening [12], adult obesity treatment [13], child and adolescent obesity prevention [14] and treatment [15], lung cancer screening [16]). These update searches were used as the reference standard for retrospective comparison of results with those generated by the Sampson-based simplified search strategy (SSS). For each review update, we identified the number of unique citations screened at the title and abstract level as well as included RCTs that were added to the review as a result of the screening.

2.1. Sampson-based simplified search strategy

All of our reference searches were run in Medline, EMBASE, and Cochrane Central and several also included PsycINFO. Consistent with the findings of the Sampson paper, our SSS involved streamlined Medline searches limited using clinical queries combined with a PubMed "similar articles" search. The simplified Medline (OVID) search was based on the reference search but with fewer synonyms for the interventions/population. Detailed search strategies can be found in Appendix at www.jclinepi.com. In the case of tinnitus, no simplification was necessary as the original search strategy contained only two search terms. The results of the Medline SSS were limited by entry date to the same dates as in the reference searches and by the appropriate clinical queries filter. The clinical queries limits in OVID are a series of validated filters that are intended to limit citation retrieval to "clinically sound" studies in nine categories (eg, therapy, diagnosis, prognosis, etiology). Each filter offers three levels of sensitivity vs. specificity (maximizes specific, maximizes sensitivity, best balance of the two). Detailed explanations of the filters can be found at http://hiru.mcmaster.ca/hiru/HIRU_Hedges_home.aspx. For our strategy, we used the "best balance of sensitivity and specificity." We used the therapy filter in most cases although the colorectal cancer screening review [9] also included a key question on test properties so in that case we used both the therapy and the diagnosis filters combined with "OR." The results were imported into separate Endnote databases for each review topic.

For the second part of the strategy, we determined the three largest and three most recent included studies in each of the original reviews. For reviews from the USPSTF or Cochrane, the three largest and three newest were selected from only those in the original review that also met our inclusion criteria for the update. Many of these studies had multiple reports and in that case if the study was included for size, we identified the main article for use in creating our strategy. If it was included for date, we used the most recent paper. If any studies were included in both newest and largest lists, they were not replaced. Each of these papers was identified in PubMed, and a "similar articles" search, limited by entry date (the same dates as in the reference search) and study type (RCT), was run. The results of these searches were combined with "OR" and imported into endnote databases that already contained the Medline results.