Improving the reproducibility and reporting quality of search strategies in biomedical systematic reviews

Impact Statement

Systematic reviews are considered by many to be the pinnacle of evidence for clinical decision-making. They synthesize evidence from other studies, while looking critically at the risk of bias in prior research, and provide guidance to clinicians and patients on appropriate and effective interventions, diagnostic tools, and more. Systematic reviews are also used for policy making, including policies that determine which treatments and devices national health care systems will use as preferred therapies. Though biomedical systematic reviews are clearly important for both individuals and society, there is abundant evidence that systematic reviews are not all created alike; some are high quality, and others poor quality. One of the key components of a systematic review's methodology is the search for the evidence that the systematic review evaluates and synthesizes. We aimed to explore ways to improve the quality and transparency of systematic review search strategies and thereby the overall methodological quality and reporting quality of systematic reviews that inform clinical decision-making. We also wanted to understand how librarians and information specialists can and should impact systematic review quality, including reducing risk of bias through improving search comprehensiveness and improving transparency and reproducibility of searches through clear reporting.

We find promising evidence that greater involvement of librarians and information specialists in the systematic review process, including co-authoring manuscripts and peer reviewing systematic reviews, is associated with higher methodological quality, better reporting, and reproducibility of search strategies. There remain, however, significant challenges to fully involving librarians and information specialists in all systematic reviews, either as team members or as peer reviewers, namely their scarcity and competing obligations. Additional tools, like PRISMA-S, can help overcome this scarcity to some degree, by making guidance for clear and transparent reporting available to any systematic review team.

Scientific impact

The most impactful component of this thesis was the creation of PRISMA-S, an extension to the PRISMA reporting guidelines focused on search strategy reporting. This tool was in high demand from librarians and information specialists internationally, and was used widely even while in draft form. It has subsequently been integrated into many librarian and information specialists' daily practice. Since the formal publication of PRISMA-S in 2021, it has been cited 1,647 times as of July 3, 2024, according to Google Scholar. Most importantly, it is cited in PRISMA 2020 as providing more guidance for its two search-related items. It is also cited in multiple other systematic review reporting guidelines within the biomedical realm as well as other disciplines, including the

PRISMA-EcoEvo extension, SEGRESS (Software Engineering Guidelines for REporting Secondary Studies), PERSiST (implementing Prisma in Exercise, Rehabilitation, Sport medicine and SporTs science), TARCiS (Terminology, Application, and Reporting of Citation Searching), and multiple additional guidance documents building on PRISMA.

Secondly, the randomized controlled trial on the impact of librarian and information specialist peer review on risk of bias and reporting quality is the first of its kind, and only the third randomized controlled trial examining the impact of methodological peer reviewers (in the other two cases, statisticians) on reporting quality. Some journals have already adopted librarian and information specialist peer review for systematic reviews and related review types, but most have not. Though this study's primary outcomes were negative, it does provide some evidence of higher rejection rates of manuscripts when librarians and information specialists are involved in methodological peer review, which could benefit journals wishing to increase the quality of the systematic reviews in their journals. In addition, this trial led to a partnership on the Librarian Peer Reviewer Database. This database currently contains the contact information for almost 300 librarians and information specialists willing to peer review. Thirty-five journal editors have already signed up to access this database. Though ultimately contracting with specific librarians and information specialists may be a more successful way of consistently getting librarian and information specialist peer review, the Librarian Peer Reviewer Database remains an important tool, especially for journals publishing too low a number of systematic reviews to warrant a permanent position.

Contributions to the librarian and information specialist community

Unequivocally, the research in this thesis has promoted the importance of the role of the librarian and information specialist to high quality systematic reviews. A decade ago, librarian and information specialist co-authorship was rare and, in many cases, controversial. Librarians, unused to asking for authorship, were only beginning to see the impact they could have on methodological and reporting quality. Since the publication of the first study in this thesis on librarian and information specialist co-authorship, librarians and information specialists have used its findings to advocate for both librarian and information specialist expertise as a required component of systematic reviews as well as co-authorship. Libraries with systematic review services cite the paper to justify their requirements for or encouragement of co-authorship. In addition, several papers have built upon this study, either using the data itself or adapting the methodology to apply to other disciplines or to local practices. Additional research builds on the co-authorship work we started, many times to assess the local impact of librarians/information specialists on systematic review search quality and reporting.

Librarians and information specialists tend to be acutely aware of how much intellectual effort goes into our contributions to systematic reviews, hence a growing interest in measuring and promoting librarian co-authorship. In 2022, the Medical Library Association (MLA) and Canadian Health Libraries Association/ Association des bibliothèques de la santé du Canada (CHLA/ABSC) jointly sent a letter to the International Committee of Medical Journal Editors (ICMJE) asking them to ensure that librarian/information specialists were not denied co-authorship on systematic reviews, either by authors or by journal policy. They state, "Librarian and information professional expertise is essential for objective and unbiased methods upon which clinical decisions are made." Their request was based on this thesis and the subsequent research based upon it. When librarians and information specialists are co-authors, they can better control the way their work is described and reported.

Systematic review services at libraries have exploded in recent years, and many libraries have now reached the point where demand is so high that they are reducing the amount of support they can provide. Not only is there a shortage of librarians and information specialists, there is a more potent force—the lack of value institutions place on libraries and librarian/information specialist contributions to research teams. We hope that the work in this thesis can be used by libraries and librarians/information specialists to justify new positions and the preservation of existing positions.

Contributions to society

Ultimately, we seek to improve the quality of published biomedical systematic reviews and thus to improve the evidence base for clinical decision-making by clinicians, patients and consumers, and policy-makers. We provide important evidence of the existence of the poor methodological and reporting quality, as well as the lack of reproducibility, of biomedical systematic review search strategies. With the potential interventions we have described (working with and co-authoring with librarians and information specialists, inviting librarians and information specialists as peer reviewers, using and adhering to PRISMA-S), we hope that we see incremental changes to quality in these impactful publications.