OPTIMISING THE PROCESS FOR CONDUCTING SCOPING REVIEWS

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Abstract

Knowledge synthesis constitutes a key part of evidence-based medicine and a scoping review is a type of knowledge synthesis that maps the breadth of literature on a topic. Conducting a scoping review is resource-intensive and, as a result, it can be challenging to maintain best practises throughout the process. Much of the current guidance describes a scoping review framework or broad ways to conduct a scoping review. However, little detailed guidance exists on how to complete each stage to optimise the process. We present five recommendations based on our experience when conducting a particularly challenging scoping review: 1) Engage the expertise of a librarian throughout the process, 2) Conduct a truly systematic search, 3) Facilitate communication and collaboration, 4) Explore new tools or repurpose old ones, and 5) Test every stage of the process. These recommendations add to the literature by providing specific and detailed advice on each stage of a scoping review. Our intent is for these recommendations to aid other teams that are undertaking knowledge synthesis projects.

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INTRODUCTION

Scoping reviews are generally undertaken to map the available research in a particular area, regardless of study design, and to identify the gaps in existing research. A scoping review is a type of knowledge synthesis that uses broad research questions and inclusion criteria for choosing relevant papers through an iterative process.[1-3] Scoping reviews follow a similar methodology as systematic reviews and require a similar amount of time and other resources to reach a high level of quality, but there are significant differences between the two approaches.[1,3] First, unlike a systematic review a scoping review does not usually involve an assessment of the quality of the primary studies. Second, scoping reviews are generally more exploratory than systematic reviews. This exploratory approach allows for the synthesis of a greater depth and breadth of available literature, making scoping reviews relevant both in emerging areas of research in which literature may be scarce and in established areas of research to obtain a broad sense of the extent of currently available evidence. Although scoping reviews are an increasingly popular methodology, there are few details in the literature about how to optimally conduct a scoping review. Two key papers on the conduct of scoping reviews[1,2] and the Joanna Briggs Institute reviewers' manual[4] are often cited as guidance; however, none of these resources provides step-by-step guidance on putting the framework into practice. We believe that the sharing of our experiences will be helpful for others interested in undertaking this type of review. Therefore, in this paper, we will share five recommendations and lessons learned through our scoping review in paediatric palliative care to aid other researchers in conducting scoping reviews.[5]

METHODS

Throughout the process of our scoping review, we were challenged by the broad scope of our research question and by the lack detailed guidance for scoping reviews.

These challenges led to difficulties both in accessing the literature and in balancing best practises in scoping reviews with available resources. After completing our scoping review, we conducted a round-table discussion with all team members to determine what aspects of our process facilitated the successful completion of our review. These suggestions were refined in subsequent team meetings and we then condensed them into five recommendations that we believe will aid other teams in optimising the scoping review process.

RESULTS

Our five key recommendations focus on the need for teams to: 1) engage the expertise of a librarian throughout the process; 2) conduct a truly systematic search; 3) create opportunities to collaborate and communicate as a team; 4) explore new research management tools, or re-purpose old ones; and 5) test every stage.

Recommendation 1: Engage the expertise of a librarian throughout the process

Although many teams that conduct knowledge syntheses consult a librarian or information professional for training when creating a search strategy, we recommend that scoping review teams should have a high level of librarian collaboration from the earliest stages of the project. The skills and knowledge a librarian brings to scoping reviews can help researchers develop a protocol that is both feasible and fundable.[6,7] Therefore, a librarian should be an active member of the research team from the project's inception. Greater librarian involvement in knowledge syntheses has also been shown to increase both the quality of the reporting and the use of recommended search methods.[8-10] The librarian should work closely with other team members to create the search strategy. Inclusion criteria need to be developed and terms appropriate to the databases to be searched must be identified. Depending on the research question and the area of study, this search can be a complex process.

Critical errors in search strategies are frequent and can lead to relevant studies being missed.[11]

Additionally, we recommend that, whenever possible, the librarian should take part in all aspects of the knowledge synthesis through an embedded role.[6,7] The embedded librarian may not only create the search strategy but also aid in evaluating tools, maintaining process documents, advocating for the use of best practises, and writing and/or editing the methods section of the resulting manuscript. We recognise that the level of librarian involvement is dependent, at least to some extent, on the level of support offered at a researcher's institution, as well as on the senior reviewer's expertise. Thus, we suggest that when the expertise is not already included on the team, then a research team should access the highest level of librarian support available to them, either through their institution or by including funding to hire a librarian on a contract basis. See Table 1 for our recommendations mapped to the extension of the scoping review framework by Levac et al.[2] In addition, see the supplementary material for an overview of our project and more detailed examples from our project for this recommendation.

Recommendation 2: Conduct a truly systematic search

Scoping review searches are iterative and take part in three stages: 1) An initial scoping search of key databases to identify relevant studies to be used in creating a final search strategy; 2) A comprehensive search of databases and other sources that is developed using the studies identified in the scoping search; and 3) A search of the reference lists in studies that have already been identified in order to find additional studies.[4] Although it is considered best practise to search other types of literature that would not be found in commercial databases so as to create a truly systematic search and decrease publication bias in the final results, knowledge syntheses often do not include grey literature or supplementary searching.[3,12] Grey literature is non-

commercially published literature, such as government reports, theses, and clinical trial registries, that is not normally available in typical databases. Hand searching, a form of supplementary searching, is manual searching, for example physically combing the table of contents of conference abstract books or print journals. Scoping review searches should be as comprehensive as possible within time and resource constraints.[4] We recommend that when developing scoping review protocols, researchers build in the needed time and resources, including financial support, so they can access the grey literature and use techniques such as citation chaining to identify studies that are unlikely to be discovered in commercial databases. It is not uncommon for the literature in an area to be dispersed across speciality and subspecialty journals and so it can be more difficult to identify studies, even with a comprehensive search strategy. For example, the 291 studies included in our scoping review had been published in 112 different journals. Therefore, it is important to make best efforts to access as much material as possible and not limit the search to only those papers that are easily accessible.

Citation chaining involves using databases such as Web of Science or Google Scholar to search the reference lists in both a published study and the publications in which the study is cited and it can be particularly helpful in identifying missed studies. In our study, we found 108 of our 291 included studies by using citation chaining. This process can be particularly useful in knowledge syntheses when at least one area of the question is not well-defined in the literature.

Researchers should carefully consider the benefits of conducting a thorough search of the grey literature, for example, clinical trial registries, theses and dissertations, and conference proceedings. Sometimes few studies may be published in commercial databases due to the lack of high-level evidence in the area. Many fields and

researchers publish study results through other means such as conference proceedings, government data, or unpublished trial data. Even though many of the studies identified through this approach might not be included in the final synthesis as they are only published as abstracts, they may help researchers identify the underlying data sources as well as other full-length study reports and research currently being conducted in the field. We believe it is important to have as systematic a search as possible and these search methods allow for a high degree of confidence that all potentially relevant publications have been found. **Recommendation 3: Facilitate collaboration and communication with all team members**

Knowledge synthesis should be a team project with team members who have complementary content expertise and various levels of experience adding different strengths to the project. Throughout the process of our scoping review, we held monthly meetings to provide updates and to discuss any questions or challenges team members might have been facing. Our team was geographically dispersed so we held our meetings using tele-conferencing software, which also allowed for team members to join when travelling or otherwise not in their office. The librarian attended all team meetings to provide expertise on best practises and to provide input so that the team could come to consensus on decisions that needed to be taken. These monthly team meetings served as an opportunity to discuss next steps, demonstrate new tools to be used, and raise questions and areas for discussion. During our screening and review phase, we met as a team to discuss unresolved conflicts. Resolving such conflicts as a team, rather than only in discussion with the relevant reviewers, can lead to meaningful discussion amongst the team that allows researchers to refine and clarify the inclusion criteria. For team members who are not content experts in the topic of

the review (e.g. students and research assistants), these discussions can provide a better understanding of the field of study.

Additionally, when planning the final collation and summary of our results, we created slides to guide team discussion. In subsequent meetings, we used iterative slides that were updated based upon team feedback. Slides allowed us to have visual representations of our results and facilitated our discussions about the areas that were key for including in our final synthesis. These meetings sparked discussion and led to new areas of investigation or more detailed investigations to be discussed by the team in the next meeting. The final version of the slides was used as a framework to write the results of our scoping review.

Recommendation 4: Explore new research management tools, or re-purpose old ones

The large amount of data obtained during a scoping review means that tracking is paramount to ensure that everything is clearly and fully documented throughout the process. For example, an initial search often produces thousands of potential documents that must then be narrowed down to the final ones that are retained in the knowledge synthesis report. This focus on tracking is especially pertinent for scoping reviews because the extent of the extant research may be unknown and relevant studies may be found in a variety of different fields and sources. There are multiple phases within a scoping review and researchers must pay close attention to documenting all aspects of the process.

In the past, scoping reviews were conducted using a reference manager and/or Excel for all phases;[1] however, these tools have their limitations, especially when managing large volume of references. Many teams, like ours, are geographically dispersed and so a system may be required that allows all members to take part in each phase despite their location. Further, the various phases in scoping reviews

require different approaches and so a single, inexpensive tool is often insufficient to use throughout the process. A number of tools have been specifically designed to help with the phases in systematic/scoping reviews and their use can result in a smoother, more efficient, and more effective process. Many are subscription-based and so researchers need to include the cost when budgeting for the study. However, there are several free tools available, although some have limited functionality. For our review, we used abstrackr for the title and abstract screening, Rayyan for the full-text review, and REDCap for data extraction.[12-14] See the supplementary material for more detail on how we used each tool for each stage of our review.

There are other available, free tools that offer support for all or most of the stages of a knowledge synthesis, including protocol development, title and abstract screening, full-text review, and data extraction. Two free tools that may be of interest to review teams are CADIMA and colandr; two paid subscription tools are Covidence and DistillerSR.[15-18] See Table 2 for a comparison of the functionality of these tools.

Recommendation 5: Test every stage

The results obtained from a scoping review are only as good as the process used by the researchers who conduct the review. Thus, it is critical that the process is refined and tested at multiple points to ensure that it is as optimal as possible. There are multiple ways to test the process and we offer a few that worked well in our project and that other researchers might find useful.

During construction, the search strategy can be tested in several ways. To ensure that the search is comprehensive enough, the librarian can test to see if a list of "perfect papers" (i.e., already identified papers the team knows should be included in the final results) are included in the search results. The omission of some "perfect papers" from the search indicates that more controlled vocabulary or keywords are necessary to ensure the completeness of the search. Researchers can also select random citations

and screen them to test the precision of the search – we found that testing 100 citations was sufficient for our purposes. If after this change only a few citations of interest are retrieved, then consider deleting controlled vocabulary and keywords that are too broad. Researchers also could add an additional search concept (a new group of controlled vocabulary terms and keywords), which makes the search more specific by adding another search concept that narrows the scope of the search.

It also is important to test each stage of screening, review, and data extraction. We recommend conducting tests using 5-10% of the total number of citations each time, a number that we found to be sufficient but not overwhelming, to allow the team to gain experience with any new tools and to ensure that all reviewers understand the inclusion criteria. To create a pilot phase, we decided on 100 references and selected random references or full-text studies using Endnote to ensure that they were representative.[19] During the testing phase, team members reviewed the smaller number of citations independently then discussed any discrepancies in their decision to retain or discard a particular reference, as already discussed above.

CONCLUSION

Scoping reviews are resource-intensive and as a result can present challenges to maintaining best practises. But some of the challenges, for example, the broad scope of the research question and the need for various approaches within each phase in scoping reviews can be mitigated, if not resolved, by attending to the five recommendations we offered: to engage the expertise of a librarian from the inception of a project, to conduct a truly systematic search, to create opportunities to collaborate and communicate as a team, to explore new tools or repurpose old ones, and to test every stage of the process. Our hope is that these recommendations will be useful for others conducting knowledge synthesis in any area of health care.

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References

1. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Sco Res*. 2005;8(1):19-32.

2. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implement Sci*. 2010;5:69.

3. Tricco AC, Lillie E, Zarin W, et al. A scoping review on the conduct and reporting of scoping reviews. *BMC Med Res Methodol*. 2016;16.

4. Peters M, Godfrey C, McInerney P, Baldini Soares C, Khalil H, Parker D. Chapter 11: Scoping reviews. In: *JBI Reviewer's Manual*. Adelaide, Australia; 2017. https://reviewersmanual.joannabriggs.org/. Accessed Feburary 27. 2020.

5. Pawliuk C, Widger K, Dewan T, et al. Scoping review of symptoms in children with rare, progressive, life-threatening disorders. *BMJ Supportive & Palliative Care*. December 2019.

6. Brander G, Pawliuk C. Research-Embedded Health Librarians as Facilitators of a Multidisciplinary Scoping Review. *Journal of the Canadian Health Libraries Association*. 2017;38(2):38-43.

7. Greyson D, Surette S, Dennett L, Chatterley T. "You're just one of the group when you're embedded": report from a mixed-method investigation of the research-embedded health librarian experience. *J Med Libr Assoc*. 2013;101(4):287-297.

8. Rethlefsen ML, Farrell AM, Osterhaus Trzasko LC, Brigham TJ. Librarian co-authors correlated with higher quality reported search strategies in general internal medicine systematic reviews. *J Clin Epidemiol*. 2015;68(6):617-626.

9. Meert D, Torabi N, Costella J. Impact of librarians on reporting of the literature searching component of pediatric systematic reviews. *J Med Libr Assoc*. 2016;104(4):267-277.

10. Koffel JB. Use of Recommended Search Strategies in Systematic Reviews and the Impact of Librarian Involvement: A Cross-Sectional Survey of Recent Authors. *PLOS ONE*. 2015;10(5):e0125931.

11. Salvador-Oliván JA, Marco-Cuenca G, Arquero-Avilés R. Errors in search strategies used in systematic reviews and their effects on information retrieval. *J Med Libr Assoc*. 2019;107(2):210-221.

12. Faggion CM, Wu Y-C, Tu Y-K, Wasiak J. Quality of search strategies reported in systematic reviews published in stereotactic radiosurgery. *Br J Radiol*. 2016;89(1062):20150878.

13. Wallace BC, Small K, Brodley CE, Lau J, Trikalinos TA. Deploying an Interactive Machine Learning System in an Evidence-based Practice Center: Abstrackr. In: *Proceedings of the 2Nd ACM SIGHIT International Health Informatics Symposium*. New York, NY, USA: ACM; 2012:819–824.

14. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan-a web and mobile app for systematic reviews. *Syst Rev*. 2016;5(1):210.

15. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research Electronic Data Capture (REDCap) - A metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42(2):377-381.

16. Kohl C, McIntosh EJ, Unger S, et al. Online tools supporting the conduct and reporting of systematic reviews and systematic maps: a case study on CADIMA and review of existing tools. *Environmental Evidence*. 2018;7(1):8.

17. Cheng SH, Augustin C, Bethel A, et al. Using machine learning to advance synthesis and use of conservation and environmental evidence. *Conservation Biology*. 2018;32(4):762-764.

18. Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia. Available at www.covidence.org

19. DistillerSR, Evidence Partners, Ottawa, Canada

20. Wanner A. Finding a random set of citations in EndNote. Expert searching. https://expertsearching.wordpress.com/2017/03/01/finding-a-random-set-of-citations-in-endnote/. Published March 2017. Accessed December 30, 2019.

Table 1: Recommendations organised by Framework Stage from Levac et al. (2010)

Framework Stage	Suggested Actions (Corresponding Recommendation Number)
1. Identifying the research question	• Enlist Librarian support from the beginning of the project for search expertise and methodological guidance. (1) • Conduct a scoping database search to familiarise your team with the literature and refine your question and your inclusion criteria. (1,5)
2. Identifying relevant studies	• Have a Librarian create your search strategy in collaboration with your team members. (1) • Test your search by seeing if "perfect papers" are included in your search or by screening 100 references to test the balance of the search. (5) • Plan and conduct a truly systematic search that includes grey literature and hand searching. (2) • Conduct citation chaining from your included studies. (2)
3. Study selection	• Seek advice from your Librarian on how to maintain best practises and balancing resources if your search yield is high – we included a phase of single screening as a first step to eliminate noise. (1) • Research and try new tools to help make the study selection more efficient. (4) • Pilot each phase by randomly selecting 5-10% of your references/full-text and having all team members independently screen/review the same ones. (5) • Decide all conflicts through team consensus to help refine the inclusion criteria and to help increase all team members' understanding. (3)
4. Charting the data	• Consider new tools or repurpose ones you already use to make data extraction more efficient - we suggest REDcap. (4) • Pilot your data extraction instrument by choosing 5-10% of your included studies and having all team members extract the same data. (5) • Hold frequent team meetings throughout this process to discuss challenges or areas of uncertainty. (3)
5. Collating, summarising, and reporting the results	• Consider collating the results as a first step in more team-friendly formats rather than a paper – we used slides to present to the team during meetings that we updated based on feedback. (3,4)

Table 2: Comparison of the Functionality of Selected Review Tools

	Excel	Reference Manager	abstrakr	Rayyan	REDCap	CADIMA	colandr	Covidence[1]	DistillerSR[1]
Supports protocol development	No	No	No	No	No	Yes	No	No	No
De-duplicates references	Somewhat[2]	Yes	No	Somewhat[2]	No	Yes	Yes	Yes	Yes
Title and abstract screening	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Full-text review	Somewhat[3]	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Data extraction	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes
Tracks and provides data to fill out PRIMSA Flow-chart	No	No	No	No	No	Yes	Yes	Yes	Yes

[1]Require paid subscriptions; [2]references need to be deleted one by one; [3]full-text must be organised and stored separately.