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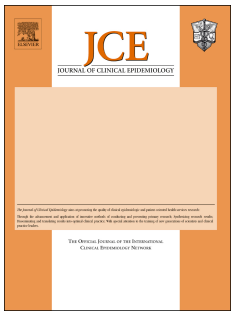

Reducing Waste and Increasing Value through Embedded Replicability and Reproducibility in Systematic Review Process and Automation

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Reducing Waste and Increasing Value through Embedded Replicability and Reproducibility in Systematic Review Process and Automation

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Clovis Mariano Faggion Jr points out a serious problem starting a valuable discussion suggesting two approaches to facilitate the reproducibility of the systematic reviews [1]. Since performing systematic reviews are already time-consuming [2] and resource-rating [3], it is arguable how adding more steps such as reproducibility test that requires more time and human resources could reduce waste and increase value compared to excluding some steps [4]. Here I discuss how the replicability of methods and reproducibility of results (RMRR) have been embedded within the systematic reviewing and how 'semi-automation' and 'sharing' could solve RMRR issues [5].

The masterminds who developed the process of systematic reviewing considered involving at least between two or three people in screening and data extraction steps. Although the purpose of double-checking could be to reduce the errors [6, 7] it also means the screening and data extraction are being repeated or replicated by at least one other member of the team to ensure the reproducibility of the same results in each step; when there are discrepancies either these two members re-consider the decision for the third time or they ask the third member's opinion. These two steps enjoy RMRR as embedded within the methodology. But how do we know if what has been said in the systematic review has actually been done? We usually trust the researchers but using the existing online semi-automated platforms that documents the steps of the systematic reviews [8-12] could help the transparency if the team share the process, methods, and results in findable, accessible, interoperable and reusable way as advised by FAIR principles [13]. This is not the best practice right now [14] but we have what it takes to do the systematic reviews once without being worried about RMRR which is a requirement in update step.

Following the protocol and sharing the data [15, 16] on the other hand, the meta-analysis step – based on established math embedded within software programs – can be repeated conveniently. It only leaves vulnerable search step behind. I intentionally kept the search, the first step, to discuss at last.

Like meta-analysis the search is rooted in computerized systems with certain differences:

- Unlike the computer programs for meta-analysis, the databases are not freely accessible to develop the search strategies or to repeat them;

- PRISMA mandates reporting of search strategy for at least one database [17] so RMRR is possible for only one database not all the databases;
- Last but not least, even if the authors decide to be generous in reporting the search strategies for all databases, they do not share the search results [14]. The main excuse for not sharing the search results is that the abstracts are copyrighted; however, it is and was always possible to share the search results excluding the copyrighted abstract after de-duplication in RIS (RefMan/Reference Manager) format.

Apart from those review teams who have the privilege of using a study-based register to conduct a register-based study [4], the search step is the weakest point in terms of RMRR in evidence synthesis [18].

While many follow PRISMA guideline in reporting the systematic reviews it is not currently the primary purpose of PRISMA to ensure the RMRR in systematic reviews. My suggestion is for PRISMA 2019 to include items that enforces the scientific principles of RMRR through public data/methods sharing based on FAIR principles and using the online automated platforms where they support public accessibility to documented processes, methods, and data.

Conflict of interests

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References

1. Faggion CM. Should a systematic review be tested for reproducibility before its publication? Journal of Clinical Epidemiology. 2019.
2. Sampson M, Shojania KG, Garritty C, Horsley T, Ocampo M, Moher D. Systematic reviews can be produced and published faster. J Clin Epidemiol. 2008 Jun;61(6):531-6. PubMed PMID: 18471656. Epub 2008/05/13. eng.
3. Borah R, Brown AW, Capers PL, Kaiser KA. Analysis of the time and workers needed to conduct systematic reviews of medical interventions using data from the PROSPERO registry. BMJ Open. 2017 Feb 27;7(2):e012545. PubMed PMID: 28242767. Pubmed Central PMCID: 5337708. Epub 2017/03/01. eng.
4. Shokraneh F, Adams CE. Study-based registers of randomized controlled trials: Starting a systematic review with data extraction or meta-analysis. Bioimpacts. 2017;7(4):209-17. PubMed PMID: 29435428. Pubmed Central PMCID: 5801532. Epub 2018/02/13. eng.

5. Shokraneh F. Reducing Waste and Increasing Value in Systematic Reviews. Invited Speech; 9 January 2019; University of Nottingham, Nottingham, UK2019.
6. Buscemi N, Hartling L, Vandermeer B, Tjosvold L, Klassen TP. Single data extraction generated more errors than double data extraction in systematic reviews. J Clin Epidemiol. 2006 Jul;59(7):697-703. PubMed PMID: 16765272. Epub 2006/06/13. eng.
7. Carroll C, Scope A, Kaltenthaler E. A case study of binary outcome data extraction across three systematic reviews of hip arthroplasty: errors and differences of selection. BMC Res Notes. 2013 Dec 17;6:539. PubMed PMID: 24344873. Pubmed Central PMCID: 3878552. Epub 2013/12/19. eng.
8. Beller E, Clark J, Tsafnat G, Adams C, Diehl H, Lund H, et al. Making progress with the automation of systematic reviews: principles of the International Collaboration for the Automation of Systematic Reviews (ICASR). Syst Rev. 2018 May 19;7(1):77. PubMed PMID: 29778096. Pubmed Central PMCID: 5960503. Epub 2018/05/21. eng.
9. O'Connor AM, Tsafnat G, Gilbert SB, Thayer KA, Wolfe MS. Moving toward the automation of the systematic review process: a summary of discussions at the second meeting of International Collaboration for the Automation of Systematic Reviews (ICASR). Syst Rev. 2018 Jan 9;7(1):3. PubMed PMID: 29316980. Pubmed Central PMCID: 5759184. Epub 2018/01/11. eng.
10. Tsafnat G, Dunn A, Glasziou P, Coiera E. The automation of systematic reviews. BMJ. 2013 Jan 10;346:f139. PubMed PMID: 23305843. Epub 2013/01/12. eng.
11. Tsafnat G, Glasziou P, Choong MK, Dunn A, Galgani F, Coiera E. Systematic review automation technologies. Syst Rev. 2014 Jul 9;3:74. PubMed PMID: 25005128. Pubmed Central PMCID: 4100748. Epub 2014/07/10. eng.
12. van Altena AJ, Spijker R, Olabarriaga SD. Usage of automation tools in systematic reviews. Res Synth Methods. 2018 Dec 18. PubMed PMID: 30561081. Epub 2018/12/19. eng.
13. Wilkinson MD, Dumontier M, Aalbersberg IJ, Appleton G, Axton M, Baak A, et al. The FAIR Guiding Principles for scientific data management and stewardship. Sci Data. 2016 Mar 15;3:160018. PubMed PMID: 26978244. Pubmed Central PMCID: 4792175.
14. Shokraneh F, Adams CE, Clarke M, Amato L, Bastian H, Beller E, et al. Why Cochrane should prioritise sharing data. BMJ. 2018 Jul 30;362:k3229. PubMed PMID: 30061322. Epub 2018/08/01. eng.
15. Shokraneh F, Adams CE. Increasing value and reducing waste in data extraction for systematic reviews: tracking data in data extraction forms. Syst Rev. 2017 Aug 4;6(1):153. PubMed PMID: 28778216. Pubmed Central PMCID: 5544999. Epub 2017/08/06. eng.
16. Wolfenden L, Grimshaw J, Williams CM, Yoong SL. Time to consider sharing data extracted from trials included in systematic reviews. Syst Rev. 2016 Nov 3;5(1):185. PubMed PMID: 27809924. Pubmed Central PMCID: 5096003. Epub 2016/11/05. eng.
17. Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. J Clin Epidemiol. 2009 Oct;62(10):1006-12. PubMed PMID: 19631508.
18. Shokraneh F. Reproducible and Replicable Search for Research Methods in Systematic Reviews. Search Solutions; 26 November 2018; British Computer Society, London, UK2018.

Declarations of interest: none