

PRISMA Statement Flow Charts for Reproducible Systematic Reviews and Meta-analyses

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Software

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Summary

The [Preferred Reporting Items for Systematic Reviews and Meta-Analyses](#) (PRISMA) Statement (Moher et al. 2009) defines an evidence-based, minimal set of items for reporting in systematic reviews and meta-analyses. PRISMA should be used for the reporting of studies evaluating randomized clinical trials (RCTs), and for reporting of systematic reviews of other types of research.

Meta-analysis is a critical tool in evidence-based medicine, forming the basis of international recommendations and guiding local medical practice. Unfortunately, a large amount of published medical research is likely to be false (Ioannidis 2005). This increases the importance of good meta-analysis of potentially flawed studies in order to reduce bias. An effort has been made to raise the standard of work accepted in major medical journals, for both primary research and systematic reviews. For example, for randomized controlled trials, we have the widely enforced CONSORT statement (Schulz et al. 2010). PRISMA is the analogue of CONSORT for meta-analysis and systematic reviews.

The importance of these efforts to raise standards is so great that the PRISMA Statement has been published in multiple medical journals (e.g., Moher et al. 2010; Liberati et al. 2009), and it is now a requirement for authors to follow its guidelines when submitting meta-analyses and systematic reviews to major journals.

In addition to increasing the standard of research in general, the movement towards reproducible research continues, with a drive to publish more data and to automate and publish the statistical analysis. The “Living Systematic Review” brings the reproducible concept to systematic reviews and extends it by allowing prompt updates as new evidence is published (Elliott et al. 2017). With these goals and trends in mind, the `PRISMAstatement` package for the R statistical software (R Core Team 2018) enables construction of a correct PRISMA flow diagram which can be generated as part of a reproducible workflow in R.

The R packages such as `ggplot2` (Wickham 2016), `rmarkdown` (Allaire, Xie, McPherson, et al. 2018), `rtables` (Allaire, Xie, R Foundation, et al. 2018) give researchers the tools to produce manuscripts incorporating their analysis, figures and text, entirely within the R environment. However, plotting flow charts is not straightforward, especially not those that confirm to the specific PRISMA statement requirements. Most researchers are likely to resort to producing their PRISMA flow diagram in another application then import the resulting figure. This is a possible source of errors, and a barrier to reproducible research: with `PRISMAstatement` it is now possible to use a reproducible workflow up-to-date PRISMA flow diagram of publication quality.

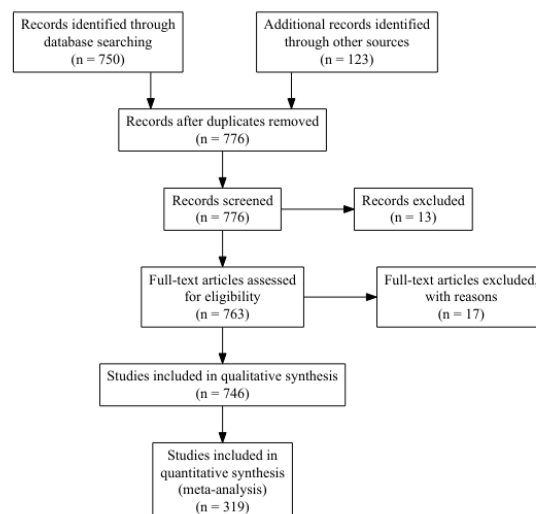


Figure 1: Example PRISMA Statement flow chart

Example PRISMA Statement flow chart

References

- Allaire, JJ, Yihui Xie, Jonathan McPherson, Javier Luraschi, Kevin Ushey, Aron Atkins, Hadley Wickham, Joe Cheng, and Winston Chang. 2018. *Rmarkdown: Dynamic Documents for R*. <https://CRAN.R-project.org/package=rmarkdown>.
- Allaire, JJ, Yihui Xie, R Foundation, Hadley Wickham, Journal of Statistical Software, Ramnath Vaidyanathan, Association for Computing Machinery, et al. 2018. *Rticles: Article Formats for R Markdown*. <https://CRAN.R-project.org/package=rticles>.
- Elliott, Julian H., Anneliese Synnot, Tari Turner, Mark Simmonds, Elie A. Akl, Steve McDonald, Georgia Salanti, et al. 2017. “Living Systematic Review: 1. Introduction—the Why, What, When, and How.” *Journal of Clinical Epidemiology* 91 (November):23–30. <https://doi.org/10.1016/j.jclinepi.2017.08.010>.
- Ioannidis, John P. A. 2005. “Why Most Published Research Findings Are False.” *PLoS Medicine* 2 (8). <https://doi.org/10.1371/journal.pmed.0020124>.
- Liberati, Alessandro, Douglas G. Altman, Jennifer Tetzlaff, Cynthia Mulrow, Peter C. Gøtzsche, John P. A. Ioannidis, Mike Clarke, P. J. Devereaux, Jos Kleijnen, and David Moher. 2009. “The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Healthcare Interventions: Explanation and Elaboration.” *BMJ* 339 (July):b2700. <https://doi.org/10.1136/bmj.b2700>.
- Moher, David, Alessandro Liberati, Jennifer Tetzlaff, Douglas G. Altman, and The PRISMA Group. 2009. “Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement.” *PLOS Med* 6 (7):e1000097. <https://doi.org/10.1371/journal.pmed.1000097>.
- Moher, David, Alessandro Liberati, Jennifer Tetzlaff, and Douglas G. Altman. 2010. “Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement.” *International Journal of Surgery* 8 (5):336–41. <https://doi.org/10.1016/j.ijsu.2010.02.007>.

R Core Team. 2018. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.

Schulz, Kenneth F., Douglas G. Altman, David Moher, and for the CONSORT Group. 2010. "CONSORT 2010 Statement: Updated Guidelines for Reporting Parallel Group Randomised Trials." *PLOS Medicine* 7 (3):e1000251. <https://doi.org/10.1371/journal.pmed.1000251>.

Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. <http://ggplot2.org>.