**A scoping review on interventions to improve adherence to reporting guidelines in health research**

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**Keywords**

Scoping review, knowledge synthesis, reporting guidelines, completeness of reporting, quality of reporting, adherence

**Abstract**

**Objectives:** The goal of this study is to identify, analyse and classify interventions to improve adherence to reporting guidelines in order to obtain a wide picture of how the problem of enhancing the completeness of reporting of biomedical literature has been tackled so far.

**Design:** Scoping review.

**Search strategy:** We searched the MEDLINE, EMBASE, and Cochrane Library databases and conducted a grey literature search for (i) studies evaluating interventions to improve adherence to reporting guidelines in health research and (ii) other types of references describing interventions that have been performed or suggested but never evaluated. The characteristics and effect of the evaluated interventions were analysed. Moreover, we explored the rationale of the interventions identified and determined the existing gaps in research on the evaluation of interventions to improve adherence to reporting guidelines.

**Results:** 109 references containing 31 interventions (11 evaluated) were included. These were grouped into five categories: (1) training on the use of reporting guidelines, (2) improving understanding, (3) encouraging adherence, (4) checking adherence and providing feedback, and (5) involvement of experts. Additionally, we identified lack of evaluated interventions (i) on training on the use of reporting guidelines and improving their understanding, (ii) at early stages of research, and (iii) after the final acceptance of the manuscript.

**Conclusions:** This scoping review identified a wide range of strategies to improve adherence to reporting guidelines that can be taken by different stakeholders. Additional research is needed to assess the effectiveness of many of these interventions.

**Strengths and limitations**

* We considered wide range of reporting guidelines as well as their extensions.
* Merging the evidence found in the published and grey literature allowed us to provide a broad picture of how the problem of enhancing adherence to reporting guidelines has been tackled so far and could be faced in the future.
* The screening and data extraction were performed in duplicate.
* We could have missed evidence of possible interventions that may not be present in the published or grey literature but are instead used in practice and continue to be used.

**Background**

Approximately 85% of all biomedical research today is estimated to be wasted, due, in part, to incomplete or inaccurate reporting (1). The past two decades have given rise to a number of changes in an effort to help authors and the broader scientific community properly report research methods and findings, which would allow them to contribute to the broader goal of combating waste in biomedical research. The most prominent of these changes has been the inception of reporting guidelines for different study types, data, and clinical areas (2).

The vast majority of reporting guidelines have not yet been assessed as to whether they help improve the reporting of research (3), but some, such as the Consolidated Standards of Reporting Trials (CONSORT) for the reporting of randomised controlled trials (RCTs) (4), have been shown to enhance the completeness of reporting (5,6).

Dozens of systematic reviews have explored the extent of adherence to some reporting guidelines in certain areas of health research (7–10). Saaman et al. (11) went one step further and performed a systematic review of systematic reviews assessing adherence to reporting guidelines. As they considered a broad range of clinical areas and study designs, their results provided a global picture of adherence to reporting guidelines in health research. Although some studies reported acceptable overall levels of completeness of reporting and found that it had improved since the introduction of certain reporting guidelines such as CONSORT, the authors of most of the reviews (43 of 50, 86%) concluded that more improvement is needed or that adherence to reporting guidelines was inadequate, poor, medium or suboptimal. Therefore, it is warranted to explore and develop strategies to improve the current levels of adherence to reporting guidelines.

In recent years, several initiatives aiming to improve adherence to reporting guidelines have been proposed, some of which have already been evaluated. For example, the effect of journal endorsement of reporting guidelines (3,5,6) and the implementation of writing aid tools for authors such as the CONSORT-based web tool (COBWEB) (12) have been assessed. While some of these strategies have not been shown to have a benefit (3), others report better but still suboptimal levels of reporting (5,6) or even clear benefits (12,13).

As mentioned, several reviews have analysed the quality of reporting in different clinical areas and for different study types (7–10). However, no scoping review has been performed that provides a global picture of different strategies aiming to improve adherence to reporting guidelines. Given the low levels of completeness of reporting in health research that have been observed (11), along with the imperative need to take further actions for mitigating this problem, we considered that performing such a scoping review was warranted.

In addition to analysing the implementation and effect of interventions that have already been evaluated, we aimed to gather other possible strategies that could be implemented and evaluated in the future.

For clarification, some relevant terms used throughout the scoping are defined in Box 1, which is based on Stevens et al. (3).

**Box 1:** relevant definitions in the context of this scoping review

**Adherence**: Action(s) taken by authors to ensure that a research report is compliant with the items recommended by the appropriate/relevant reporting guideline. These can take place before or after the first version of the manuscript is published.

**Endorsement**: Action(s) taken by journals to indicate their support for the use of one or more reporting guideline(s) by authors submitting research reports for consideration.

**Implementation**: Action(s) taken by journals to ensure that authors adhere to an endorsed reporting guideline and that therefore published papers are completely reported.

**Complete reporting**: Pertains to the state of reporting of a study report and whether it is compliant with all the items recommended by the appropriate/relevant reporting guideline.

**Methods**

As presented in the published protocol (14), this scoping review follows the methodology manual published by the Joanna Briggs Institute for scoping reviews (15).

**Objectives**

The scoping review questions are:

1. What interventions to improve adherence to reporting guidelines in health research have been evaluated?
2. What further interventions to improve adherence to reporting guidelines have been performed or suggested but never evaluated?

We aimed to analyse and classify the interventions found for both questions in order to obtain a wide picture of how the problem of adhering better to reporting guidelines has been tackled so far and can be tackled in the future.

**Eligibility criteria**

We included:

1. Studies evaluating interventions aiming to improve adherence to reporting guidelines in health research, irrespective of study design.
2. Commentaries, editorials, letters, studies, and online sources describing possible interventions to improve adherence to reporting guidelines that have been performed or suggested but never evaluated.

The reporting guidelines considered were those shown on 8 May 2017 on the EQUATOR (Enhancing the QUAlity and Transparency Of Health Research) Network website (16) as “Reporting Guidelines for main study types”. In addition, we included QUOROM (Quality of Reporting of Meta-analyses), since it was the precursor of PRISMA. Supplementary file 1 shows all reporting guidelines considered.

We considered the following languages: English, Spanish, French, German and Catalan.

**Exclusion criteria**

We have excluded references that include interventions that do not specifically aim to improve the completeness of reporting, even though these interventions may actually influence completeness. For example, we have excluded clinical trial registration even though it may enhance completeness of reporting, because its main goals are to improve clinical trial transparency while also reducing publication and selective reporting biases.

**Search strategy and study selection**

On 8 May 2017, we searched PubMed, EMBASE, and Cochrane Library databases for articles published between 1 January 1996 and 31 March 2017, in accordance with our scheduled search (14). The detailed search terms for PubMed can be found in the protocol.

The retrieved studies were exported into Mendeley and duplicates were automatically removed using it. One reviewer (DB) first screened the titles and abstracts for eligibility. Each of the other two reviewers (JJK and EC) was randomly assigned 50% of the references and screened the titles and abstracts independently of the first reviewer. The reviewers classified the references into one of the following groups:

1. Evaluated: Includes references describing interventions to improve adherence to reporting guidelines that have been empirically assessed.
2. Non-evaluated: Includes references describing interventions to improve adherence to reporting guidelines that have been performed or suggested but never evaluated.
3. Unclear: Includes references (i) containing vague statements such as “Authors, editors, and journals have to adhere better to reporting guidelines to improve the quality of reporting” or “greater efforts have to be made by authors to check that their research is compliant with [the relevant reporting guideline]”, or (ii) not having the abstract available.
4. Excluded: Includes references (i) not describing interventions to improve adherence to any of the reporting guidelines considered and (ii) describing but not evaluating certain interventions that have already been classified as evaluated.

Disagreements were solved by discussion among the reviewers.

Second, one reviewer (DB) examined the full-text of all group A and B references to confirm the previous classification, then all group C references to reclassify them either as group A, B, or D. Re-classification was verified by the initial reviewer (JJK or EC). Finally, one reviewer (DB) ensured literature saturation by searching the reference lists of included studies, the lists of articles citing them according to PubMed, and the individual studies included in two relevant systematic reviews (3,6).

In addition, we performed a grey literature search, which included: the websites of networks and organizations promoting the use of reporting guidelines (i.e., EQUATOR Network and National Library of Medicine Research Reporting Guidelines and Initiatives); work groups of medical journal editors (i.e., International Committee of Medical Journal Editors (ICMJE) and World Association of Medical Editors (WAME)); biomedical journal publishers (i.e., BMJ Publishing Group and BioMed Central); funding agencies (i.e., National Institute of Health (NIH) and European Research Council); online platforms of post-publication peer review (i.e., PubPeer and ScienceOpen); and the abstract books of the past editions of the International Congress on Peer Review and Biomedical Publication.

Some of the included references were described in studies co-authored by some of the authors this scoping review. These references underwent the same process of screening, data extraction, and data synthesis as the others.

**Data extraction**

A data extraction form was developed to collect the information necessary for data synthesis. Two reviewers (DB, JJK) independently performed a pilot data extraction on a random sample of 5 articles and subsequently refined the form.

Extracted data included:

1. Publication characteristics: title, year of publication, author, author’s affiliation country, and field of study.
2. Characteristics of the intervention:
	1. Classification as evaluated or non-evaluated.
	2. Research stage: education, grant writing, protocol writing, manuscript writing, submission, journal peer review, copy-editing, and post-publication.
	3. Rationale of the intervention, which refers to the deduced reasons why the intervention is evaluated or proposed.
	4. For evaluated interventions: details of the intervention, study design (e.g. RCT, before-after, etc.), reporting guidelines considered and format (checklist, bullet points and/or examples), period of intervention, number of journals and articles involved, effect size of the intervention on adherence to reporting guidelines and measure used to assess this effect.
3. Relevant conclusions.

Two reviewers (DB, JJK) independently performed data extraction for all studies except for the individual studies of the two systematic reviews evaluating journal endorsement of reporting guidelines (3,6), since none of these studies described further interventions and their results had already been reported in these reviews. Discrepancies between reviewers were discussed and solved by consensus.

**Data synthesis**

Following data extraction, interventions to improve adherence to reporting guidelines were categorised as follows:

1. Training on the practical use of reporting guidelines: mentoring of different stakeholders on the practical use of reporting guidelines.
2. Enhancing accessibility and understanding: dissemination of reporting guidelines and the improvement of authors’ understanding of their content.
3. Encouraging adherence: suggestions and tools to facilitate compliance.
4. Checking adherence and providing feedback: checking the level of compliance and indicating incorrect or missing items.
5. Involvement of experts: interaction and cooperation on methodology and reporting.

One reviewer (DB) performed the initial categorization, which was verified and refined by the other two reviewers (JJK and EC).

Furthermore, we determined the existing gaps in research on the evaluation of interventions to improve adherence to reporting guidelines. More specifically, we identified which categories of interventions and which research stages have not been addressed so far in studies evaluating interventions.

We did not perform a meta-analysis of the observational studies assessing journal endorsement of reporting guidelines that were not included in the two systematic reviews previously mentioned (3,6). We considered that, for the purpose of this scoping review, these systematic reviews provided a reliable picture of the impact of this editorial intervention.

**Deviations from the protocol**

In order to better capture the most relevant aspects of the included studies, the original data extraction form proposed in the protocol was modified. We removed the health care area of the studies included, refined the research stages considered, and included more details on the implementation of the evaluated interventions.

**Patients and public involvement**

No patients or public were involved in the study.

**Results**

The database search yielded 1399 citations after deduplication (see Figure 1). Screening of titles and abstracts resulted in a first classification, after which 435 papers were included for full text review. We also reviewed the full text of 24 additional references found through forward citation searching. Furthermore, a grey literature search yielded 7 additional references. Finally, 109 references were included. Some of these interventions appeared in more than one reference and some of the references contained more than one intervention. 90 of these references (86 observational and 4 randomised studies) described 11 evaluated interventions and the other 19 (12 research studies, 2 editorials, 2 blogs, 1 commentary, 1 essay, and 1 perspective) described 20 non-evaluated interventions. Figure 2 displays these 31 interventions according to their categorization and the research stage where they can be performed. Moreover, Table 1 shows all interventions in a tabular format together with their rationale. All interventions reported in this section were found in the literature and do not necessarily correspond to the personal ideas of the scoping review authors.

Among the 11 evaluated interventions identified, we found a variety of measures used to assess their effect on adherence to reporting guidelines, including:

* Score for completeness of reporting for each paper, either assigning different or equal weights to RG items, on a 0-10 scale.
* Percentage of items reported for each paper.
* Percentage of compliance per RG item.
* Score for the Manuscript Quality Assessment Instrument (17) for each paper.

Due to the heterogeneity of these measures and for the sake of clarity, we prefer to omit the information on the exact effect sizes in the main body of the manuscript and show it in Supplementary file 2, together with the implementation details of the evaluated interventions. In this way, these effects can be understood in an appropriate context.

Research gaps identified (see Figure 3) included the evaluation of interventions (i) on training on the use of reporting guidelines and improving understanding of these, and (ii) at early stages of research (education, grant writing or protocol writing), and (iii) after the final acceptance of the manuscript (copyediting or post-publication peer review).

Hereafter, we describe the interventions found for each category (Table 1 and Supplementary file 2 summarise these interventions).

***Training on the practical use of reporting guidelines***

Four non-evaluated interventions related to educating different stakeholders on the practical use of reporting guidelines were found (18-23).

In a first step, health profession schools could incorporate reporting guidelines into curricula that address research methodology and publication standards (18–22). In line with this, students could develop protocols for coursework and research using reporting guidelines such as SPIRIT (randomised trials) and PRISMA-P (systematic reviews), and educators may encourage adherence to those guidelines and grade the protocols using them (21). For their part, funders may consider supporting author training on reporting guidelines (23). Finally, journals or publishers may consider investing resources in training editors and reviewers on the content and use of reporting guidelines (22,23).

***Enhancing accessibility and understanding***

We identified three non-evaluated interventions focused on increasing the awareness of the existence of reporting guidelines, as well as the authors’ understanding of content of these (24-26).

First, international scientific associations may play an important role in disseminating and popularizing reporting guidelines to large audiences (24). Second, reporting guideline developers might consider translating them to new languages that have not been addressed yet (25). Finally, further databases of examples of good reporting for different reporting guidelines that are accessible to authors can be developed, as has been done for CONSORT (26).

***Encouraging adherence***

Fourteen interventions found were associated with different strategies to facilitate compliance with reporting guidelines (11,12,21,27–115). Six of these were evaluated (47)(12,27–46,48–107,113).

Funders might require authors to use reporting guidelines as a template for grant application proposals (21). Later on, research ethics boards may require that protocols submitted for ethical approval clearly state which reporting guidelines the study will be using based on the study design, and that reporting guideline checklists are part of the application for ethics approval (11). Funders could also encourage adherence to reporting guidelines by asking for reporting guideline checklists as part of the authors’ report (21,108).

One initiative to support authors adhering to reporting guidelines at the writing stage of the manuscript has been COBWEB, a writing aid tool that aims to help authors adequately combine the different extensions of the CONSORT statement (12). This tool divided the CONSORT items into bullet points showing the key elements that need to be reported together with examples of adequate reporting. The impact of COBWEB was evaluated in a randomised trial that showed a large effect of this intervention (12) (see Supplementary file 2 for more details about this and other evaluated interventions). A second option to support authors at manuscript writing is that they follow a more structured approach. For example, ClinicalTrials.gov requires authors to report key information in a tabular format when registering a study or making available its results (116). This has been shown to be effective: some results posted on this platform, especially harms, are more complete than those in corresponding journal articles reporting the same trials (47). Another possibility to improve the structure of manuscripts is to include new subheadings corresponding to different reporting guideline items within the traditional IMRaD format (Introduction, Methods, Results, and Discussion), as the American Journal of Orthodontics and Dentofacial Orthopedics (AJO-DO) proposed (112). Finally, authors may also avoid omissions when writing the manuscript if mark up the text and highlight where each item of the relevant checklist is addressed (109).

At manuscript submission stage, different editorial actions have been taken to improve adherence to reporting guidelines. The most popular is what has traditionally been defined as journal endorsement of reporting guidelines, which is usually defined as one or more of the three following interventions: (a) journal editorial statement endorsing certain reporting guidelines; (b) requirement or recommendation in journal’s ‘Instructions to Authors’ to follow certain reporting guidelines when preparing their manuscript; or (c) requirement for authors to submit the appropriate reporting guideline checklist together with their manuscript indicating page numbers corresponding to each item (6). Dozens of observational studies have explored the possible effect of journal endorsement of different reporting guidelines in different clinical areas (27–46,48–106,113). A recent systematic review focused on CONSORT evaluations showed relative but suboptimal improvements in the completeness of reporting in journals by following the aforementioned policies (6), while another systematic review considering 9 other guidelines showed no improvements (3).

Journals might also consider other strategies to enhance adherence to reporting guidelines at submission. A first option could be to develop shorter, core versions of reporting guidelines containing key items, which could be provided to authors as part of the submission process (110). Second, they might introduce publication officers in order to provide guidance to authors on preparing manuscripts for submission (111). Third, editors may ask authors to populate the relevant checklist with text from their manuscript and not accept a submission unless this is provided (114).

Finally, editors may suggest that peer reviewers use reporting guidelines (107). In addition, by asking peer reviewers questions about whether the author has followed reporting guidelines, this might be an indirect way to encourage them (115).

***Checking adherence and providing feedback***

Eight interventions were related to monitoring level of compliance with reporting guidelines of the manuscripts and providing instructions to authors on how to improve the reporting of missing or incorrect items (13,117–123). Four of them were evaluated (13,117–119).

Some journals have opted for implementing reporting guidelines at peer review. First, an associate editor may assess manuscripts for adherence to the relevant reporting guideline and ask authors to make changes accordingly (117). This process may be repeated until the associate editor thinks that the manuscript can move to the next step of the review process, leading to an editorial decision. This intervention was evaluated at the AJO-DO and showed satisfactory results: 33 of 37 items reached perfect compliance (117). Second, peer reviewers could also assess the manuscripts against the appropriate checklist (118). While the observed effect of this intervention was slightly positive, it was smaller than hypothesized. In fact, investigators pointed out that authors tended to comply better with suggestions coming from standard reviews rather than from reviews against reporting guidelines, implying that it might be difficult to adhere to high methodological standards at late stages of research if these standards are not considered earlier in the research process. Third, journals could also ask trained editorial assistants to check manuscripts against reporting guidelines (120) or to implement automatic peer review tools such as Statreviewer (124), software that automatically checks adherence to reporting guidelines and evaluates the appropriate use and reporting of statistical tests (121). Currently, its performance is being assessed through a pilot trial in collaboration with four BioMed Central Journals (121). In any of those cases, emails could be sent to authors asking them to revise the manuscript according to guidelines (13). To do this, the EQUATOR Network has provided standard letters that can be used a) after checks by an editor or a single peer reviewer, b) after full peer review, or c) alongside acceptance (125). Furthermore, at the time of author revision of the manuscript, Hopewell et al. found no significant effect when incorporating WebCONSORT, a web-based tool that generates a unique list of items customised to the trial design, to the revision process of journals that endorsed CONSORT but had no active policy for implementing it (119). Finally, in a late stage of the publication process, copyediting of the manuscript could also ensure that all items are covered (122).

Once the paper is published, the scientific community could use online platforms of post-publication peer review such as PubPeer (126) or ScienceOpen (127) to evaluate the adherence to reporting guidelines of published articles and to provide feedback to authors (123).

***Involvement of*** ***experts***

Two interventions identified implied interaction and cooperation between authors and experts on methodology and reporting at different stages of research (78,108,128–130). One of them was evaluated (78,128–130).

On the one hand, statisticians (or epidemiologists or other quantitative methodologists) may get involved in the design, conduct or reporting of the study might contribute to properly reporting key areas such as sample size calculation, randomization, blinding, and appropriate statistical analysis (129). While three studies found a statistically significant positive relationship between CONSORT scores and statistician involvement (78,129,130), another one did not (128). On the other hand, it has been hypothesized that the involvement of medical writers during the manuscript writing stage of research could improve the completeness of reporting (108).

**Interventions described in papers co-authored by authors of this scoping review**

25 (of 109) included references describing 21 (of 31) included interventions were co-authored by at least one of the authors of this scoping review (12,13,63,67,74,76,80,104,107,111,114,115,20,117–120,123,21–23,26,47,54,55).

**Discussion**

In this scoping review, we identified 31 interventions to improve adherence to reporting guidelines. We have also determined the gaps in research on the evaluation of this type of interventions. By considering a wide range of reporting guidelines as well as their extensions and merging the evidence found in the published and grey literature, this review provides a broad picture of how the problem of enhancing adherence to reporting guidelines has been tackled so far and could be faced in the future.

This study reveals that most published research aimed at improving adherence to reporting guidelines has been conducted in journals. Typically, journal strategies range from making available editorial statements that endorse certain reporting guidelines, recommending or requiring authors to follow reporting guidelines in the “Instructions to authors”, and requiring authors to submit a reporting guideline checklist together with the manuscript, with page numbers indicated for each item. However, these strategies have been shown not to have the desired effect (3,6,131). Recent research has called for more active and enforced journal policies throughout the editorial process, such as requiring the use of structured approaches with new subheadings adapted to different kinds of study designs (112), which was also found to be beneficial in a new study outside of our search period (132); providing guidance on manuscript preparation (111); making sure the peer review process involves editorial assistants who have specific training on reporting issues (120); and implementing automatic peer review tools (121). Journals will vary in their ability to make some of these strategies effective, depending on factors such as their resources, their guidelines to peer reviewers and the dedication of their editors – many editors and editorial staff work part-time and have limited amount of time.

Moreover, editors’ education and performance should be improved. A recent study pointed out that more than a third (39%) of the manuscripts classified as randomised trials by the editorial staff were not actually randomised trials (119,133). Consequently, it seems difficult to improve author and peer reviewer adherence to reporting guidelines if journal gatekeepers are not properly trained in methodological and reporting issues.

Apart from journals, editors and peer reviewers, other key stakeholders such as medical schools, research funders, universities and other research institutions should also take responsibility regarding this issue. This scoping review provides some strategies to follow. However, as the problem is complex and the possible interventions are varied, enhancing the completeness of reporting most likely depends not so much on any isolated action but on a set of strategies by several different stakeholders. These could be enacted at different stages of research, from education to article post-publication.

For interventions aiming to improve adherence to reporting guidelines, we should require the same level of evidence that we require for interventions to improve health. For this reason, it is striking that we found only 4 published randomised trials that evaluated interventions to improve adherence to reporting guidelines (12,107,118,119). Among these trials, statistically significant effect of the intervention was only observed for the use of the writing aid tool for authors COBWEB (12). While performing an additional review against reporting guidelines showed slightly positive but not significant effect (118), suggesting the use of reporting guidelines to peer reviewers (107) or implementing at the process of author revision of the manuscript the web-based tool WebCONSORT showed no benefit (119). The rest of the evaluations of interventions found (86 of 90) were observational studies, whose results are subject to the influence of confounding factors. As already mentioned, the impact of journal endorsement on completeness of reporting was suboptimal (3,6). However, completeness of reporting improved remarkably when reporting guidelines were actively implemented by editors (e.g. if editors perform a completeness of reporting check of the manuscript (117)) and when research results were posted in a tabular format without discussion or conclusions (47). Future randomised trials should consider evaluating these interventions or addressing some of the research gaps identified in this review, such as improving adherence to reporting guidelines at the grant application or protocol writing stages.

A few of the interventions found in this review were shown to enhance adherence to reporting guidelines. However, it is noteworthy there is no evidence that some successful interventions (12,117) have been implemented more widely later. For this reason, more resources and efforts are needed to further implement these interventions in other settings, evaluate the effect, and share the results with the scientific community. In any case, it is important to keep in mind that contemporary publication culture may harm the potential improvements in reporting quality. This could result from the fact that most scientists feel that the primary evaluation tool of their research is the quantity of their scientific output rather than its quality (134); and such attitudes may undermine the potential effect of any intervention to improve adherence to reporting guidelines.

Our scoping review has some limitations. First, we did not formally assess the methodological quality of the studies that evaluated interventions. Second, restricting to certain databases or not having standard search terms for the databases searched may have excluded relevant publications. Third, it is possible that we could have missed evidence of possible interventions that may have never been reflected in the published or grey literature but are instead used in practice and continue to be used. For example, journals might be applying specific editorial strategies that are not publicly available on their websites or in the published literature.

**Conclusion**

Improving adherence to reporting guidelines is one of the key issues in order to enhance complete and accurate reporting and therefore reduce waste in research.

Different stakeholders – such as research funders, ethics boards, and journals – should consider implementing and evaluating some of the interventions identified in this study.

**List of abbreviations**

AJO-DO: American Journal of Orthodontics and Dentofacial Orthopedics; CONSORT: CONsolidated Standards Of Reporting Trials; COBWEB: CONSORT-based web tool; EQUATOR: Enhancing the QUAlity and Transparency Of Health Research; RCT: Randomised Controlled Trial; RG: Reporting Guideline; SPIRIT: Standard Protocol Items: Recommendations for Interventional Trials; PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

**Declarations**

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**Competing interests:** DA and DM are Directors of the UK and Canadian EQUATOR Centres, respectively. IB is deputy director of French EQUATOR Centre.

**Author contributions:** All authors contributed to conceptualizing and designing the study. DB, EC, and JJK independently performed screening. DB and JJK independently performed data extraction. DB performed initial data synthesis and EC, IB, DM, DGA, and JJK refined it. DB drafted the manuscript. EC, IB, DM, DGA, and JJK made major revisions. Due to the strong involvement of JJK and EC at several different stages of the study, all authors agreed to consider them joint senior authors of the scoping review, although EC was the only senior author of the protocol. All authors read and approved the final manuscript, which was completed in April 2018. DGA passed away in June 2018 and therefore could not approve the revised manuscript (November 2018).

**Availability of data and materials:** The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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**Figures, tables and supplementary files**

**Figure 1:** PRISMA flow diagram.

**Figure 2:** Typology of interventions to improve adherence to RGs according to type of intervention and research stage. **Legend:** Evaluated interventions are shown in bold.

**Figure 3**: Gaps in research on the evaluation of interventions to improve adherence to reporting guidelines. **Legend:** Each circle represents one intervention. Variables displayed: 1) Circle size: Number of studies evaluating each intervention (bigger = more studies); 2) Circle colour: Study design of those studies (blue for RCTs and green for observational studies) and 3) Circle fill: Kind of RG implementation (plain for checklist and stripes for bullet points and examples). Research gaps are highlighted in red.

**Supplementary file 1:** Description of the acronyms and full names of all reporting guidelines considered.

**Supplementary file 2**: implementation details of the evaluated interventions.

**Table 1:** Rationale of the interventions identified.

|  |  |  |
| --- | --- | --- |
| **Group** | **Intervention** | **Rationale** |
| **Training on the practical use of RGs** | Introduction of RGs & journalology into graduate curricula (18-22) | To introduce good research reporting habits early in young researchers' scientific careers. |
| Student’s development of protocols for coursework and research using RGs (21) |
| Funder’s support of author training on RGs (23) | Authors, editors, and peer reviewers have insufficient training in issues related to reporting. |
| Training for peer reviewers and editors on RGs by journals (22,23) |
| **Enhancing accessibility and understanding** | Dissemination of RGs by scientific associations (24) | A large number of researchers are not aware of the existence of RGs. |
| Translation of RGs to further languages (25) | Language barriers may affect the proper use of RGs. |
| Development of expanded database of examples for each RG (26) | Authors need more examples of good reporting to properly understand certain items. |
| **Encouraging adherence** | Author use of RGs as a template for grant application proposals (21) | Using RGs in early stages may facilitate completeness of reporting of published research.  |
| Required checklist for ethics approval application (11) |
| Funder's requirement of checklists in author's report (21,108) |
| Author use of the writing aid tool COBWEB (12) | A) Authors need help to successfully adhere to RGs at the writing stage and B) Dividing RG items into bullet points and providing examples might help. |
| Author use of a structured approach for reporting research (47,112) | A) To help authors avoid omissions, B) to aid reviewers and editors in appraising articles and C) to allow more efficient data extraction during the systematic review process. |
| Author markup of the manuscript to indicate where each RG item is addressed (109) |
| Editorial statement endorsing certain RGs (27–46,48–106,113) | Authors read editorial statements and follow “Instructions to authors”. |
| Recommendation or requirement to follow RGs in the "Instructions to authors“ (27–46,48–106,113) |
| Requirement to submit a RG checklist together with the manuscript indicating page numbers corresponding to each item (27–46,48–106,113) | Authors may not consider editorial statements or recommendations in “Instructions to authors” to be important. Compulsory submission of checklists or text mark-up may encourage authors to be more compliant with RGs. |
| Requirement to populate and submit a RG checklist with text from the manuscript (114) |
| Journal development of core versions of RGs containing key items (110) | Focusing on the most important items could be more effective than considering the whole checklist. |
| Guidance to authors on manuscript preparation by publication officers (111) | Trained journal officers may enhance authors’ compliance with RGs during manuscript preparation. |
| Suggestion for peer reviewers to use RGs (107) | Peer reviewers often do not detect reporting flaws. Therefore, they may need to follow a more systematic approach and use RGs. |
| Editor’s questions to peer reviewers about whether the authors have followed RGs (115) |
| **Checking adherence and providing feedback** | Completeness of reporting check by editors (117) | Requiring checklists at submission does not guarantee adherence. Editors and peer reviewers have to check whether submitted papers are compliant with RGs. |
| Peer review against RGs (118) |
| Internal peer review against RGs by a trained editorial assistant (120) | It is extremely unlikely that the average clinical peer reviewer has the methodological expertise to check a paper against RGs. |
| Implementation of the automatic tool Statreviewer (121) |
| Email to authors to revise the manuscript according to RGs (13) | It might be more effective to ask authors for adherence to RGs during the revision process because they will do anything to get their paper published. |
| Implementation of the tool WebCONSORT (119) |
| Completeness of reporting check at copy-editing (122) | Copy-editing and post-publication offer alternate time points to improve adherence to RGs. |
| Post- publication peer review (123) |
| **Involvement of experts** | Statistician involvement (78,128-130) | Professionals with specific knowledge of RGs might help authors when designing, conducting or reporting their research. |
| Medical writer involvement (108) |