What Editors and Reviewers Look for: Tips for Successful Research Publication

4

Ryan Stancil, Seth S. Leopold, and Adam Sassoon

4.1 Introduction

Scientific reporting of original biomedical research can and should be demanding. After all, the health and well-being of our patients depends not just on the rigor of the studies being reported but also on our ability to understand who was included in those studies, how they were treated, and how endpoints were assessed. Clarity, therefore, is critical.

But demanding need not mean difficult. Sensible principles underlie the reporting standards that journals use and tools can make presenting the material much easier on authors. This chapter highlights the common challenges authors face as they set out to present their work for publication in peer-reviewed journals, offers some tips to help mitigate those challenges, identifies several common mistakes that recur in scientific reporting, and proposes some ways to avoid them.

4.2 What Are the Challenges?

Undoubtedly, the challenges vary—based on the authors' experiences as researchers, the resources available, the topics being studied, and countless other factors. But we

R. Stancil (✉) • A. Sassoon
Department of Orthopaedics and Sports Medicine,
University of Washington, Seattle, WA, USA
e-mail: ryands@uw.edu

S.S. Leopold
Clinical Orthopaedics and Related Research,
University of Washington, Seattle, WA, USA

C. Mauffrey, M.M. Scarlat (eds.), *Medical Writing and Research Methodology for the Orthopaedic Surgeon*, https://doi.org/10.1007/978-3-319-69350-7_4

find that successful research papers have several things in common. Papers that succeed in peer review:

- Ask focused, answerable research questions.
- Summarize their methods clearly.
- Present their results so the reader remembers them.
- Structure the introduction and discussion for maximum effect.
- Outline and justify the study's limitations.

4.3 Tips and Tricks for a Successful Submission

4.3.1 Ask Focused, Answerable Research Questions

Good research begins with good questions. To attract the attention of readers—a key mission of most journals—questions should be relevant to research or practice and should not have been answered definitively by earlier work. For the project to be practical, the questions must also be answerable within the means available: sufficient patient volume, financial and staff resources, equipment, and experience. Large studies, randomized or prospective studies, and blinded studies all increase the demands on the research team's experience and resources.

Clear questions focus on specific endpoints. Compare the following research questions:

"Is the risk of hip dislocation within 6 months of surgery greater in the direct anterior or the posterior approach to total hip arthroplasty?"

and

"What are the outcomes of direct anterior total hip arthroplasty?"

The former is an example of a clear question: In a single sentence, it describes the patient population, the intervention or exposure that will be studied, the comparator groups, and the outcome of greatest interest. A well-focused research question points to plausible methods that might be used to answer it (more on this just below) and gives the reader a clear expectation of what (s)he will gain by reading the study. The latter gives the reader no real inkling of what the study is about.

Vague terms like "outcomes" or "results" in general should be avoided in research questions, in favor of more specific, testable endpoints.

4.3.2 Summarize the Methods Clearly

Research questions that focus on specific questions help readers, but they also guide the research team to the right methods to answer them. Vague questions—like "what are the outcomes of direct anterior total hip arthroplasty?"—provide no such guidance. In this context, "outcomes" could refer to pain relief, return of function, the proportion of patients experiencing complications or undergoing reoperation, cost-effectiveness, or any of dozens of other more meaningful endpoints, each of which would call for entirely different study designs. Our better question—about early

dislocations after surgery—can help the research team craft suitable methods to for arriving at the answers.

If the research design is particularly complicated, beginning a methods section with an overview paragraph that provides the "big picture" can be helpful. An experimental design figure can also sometimes help, if there are multiple experiments or modalities.

If the study asks several questions, as many do, there is nothing wrong—and a lot right—with topic sentences like "To test our first question [*restate question here*], we [*briefly summarize methods on how the first question was tested].*"

Good tools exist that can help the clinician-scientist present his or her methods clearly. The Centre for Evidence-Based Medicine has published multiple "Critical Appraisal Worksheets" for the common study designs: systematic review, diagnosis, prognosis, and therapy/RCT [1]. In these, an author can ensure that the methods presentation addresses the common sources of bias that readers care about in each of those study designs. They are briefly summarized below in Table 4.1.

In addition, three widely accepted and easy-to-use checklists walk authors through the most common types of clinical research studies. STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) is handy for writing up retrospective clinical studies of many designs, including cohort, case control, and cross-sectional studies [2]. CONSORT (Consolidated Standards of Reporting

Table 4.1 Critically appraising clinical research methods

<table>
<tr><th></th><th>Diagnostic study</th><th>Prognostic study</th><th>Therapy or RCT</th><th>Systematic review</th></tr>
<tr><td rowspan="6">Are the results valid?</td><td rowspan="3">Test evaluated in a representative spectrum of patients?</td><td rowspan="2">Patients assembled at a common (early) point in disease course?</td><td>Assignment of patients random?</td><td rowspan="2">What question did the systematic review address?</td></tr>
<tr><td>Groups similar at start of trial?</td></tr>
<tr><td>Follow-up sufficiently long and complete?</td><td>Groups treated equally?</td><td rowspan="2">Unlikely that important, relevant studies were missed?</td></tr>
<tr><td rowspan="3">Reference standard applied universally?</td><td>Outcome criteria objective or applied blindly?</td><td rowspan="3">All patients that entered the trial accounted for?</td></tr>
<tr><td rowspan="2">Adjustments made between subgroups?</td><td>Appropriate article inclusion criteria?</td></tr>
<tr><td>Included studies valid for question?</td></tr>
<tr><td>Independent, blind comparison between index and gold standard tests?</td><td>Measures objective or were patients and/or clinicians blinded?</td><td>Results similar from study to study?</td></tr>
</table>

(continued)

Table 4.1 (continued)

	Diagnostic study	Prognostic study	Therapy or RCT	Systematic review
What are the results?	Test characteristics presented? (sensitivity, specificity, positive predictive value, negative predictive value)	How likely are the events over time? [graph suggested]	How large was the treatment effect?	How were the results presented? [forest plot suggested]
		How precise are prognostic estimates?	What were the measures (RR, ARR, RRR, NNT)?	Heterogeneity explored?
			How precise was the estimate of treatment effect?	
Applicability of results?	Methods described in sufficient detail to permit replication?	Applicable to individual or group of patients?	Applicable to individual or group of patients?	Applicable to individual or group of patients?

Trials) walks the author through the key elements of randomized controlled trials [3]. Finally, PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analysis) covers what authors would want to know about the reporting of systematic reviews and meta-analysis [4]. Covering these in detail is beyond the scope of this chapter, but these tools are easy to use, comprehensive, and freely available on the Internet. In fact, their use is mandated by many better journals, including *The Journal of Bone and Joint Surgery* and *Clinical Orthopaedics and Related Research.*

4.3.3 Present the Results so the Reader Remembers Them

While every study design—indeed every study—will make different demands on its author in terms of how the results should be presented, the author should try not to make too many demands on the reader in the results section. After all, this is where the study's key messages get delivered, and the goal is to help the reader understand those messages. Several simple steps can help.

First, consider organizing the results section in parallel with the research questions. If there are three research questions or purposes, consider answering them with three results paragraphs, in the same order as those questions were posed. Remember, science is the process of answering questions. Presenting the questions and their answers in sequence makes it more likely the reader will retain those answers.

Next, rather than diving straight into complex analyses or statistics, begin each results paragraph with a plain language summary sentence that contains a minimum of jargon or names of statistical analyses. In fact, there is little reason to present the names of analyses at all in the results section, since they were already covered in

methods. In this part of the paper, the reader wants the answers to the questions, not how those answers were derived.

Finally, focus on effect size and direction rather than "statistical significance." Again, the methods section should already have defined what the paper considers a statistical difference that was unlikely to have been a chance effect, and so the reader trusts that the author will not claim a "difference" that did not pass the relevant statistical test. In the results section, the reader simply wants know how large the difference was, and which treatment it favored.

For example, imagine a study that evaluated a new topical anticoagulant used during spine surgery by comparing it to placebo. Which topic sentence conveys more information?

When comparing Nobleedum spray to placebo, a significant difference was found on the t-test ($p < 0.05$).

or

Patients treated with Nobleedum spray experienced less blood loss during surgery than did patients treated with the placebo (850 ± 75 versus 400 ± 50 cm^3, $p = 0.02$).

The second example is more effective because it identifies the endpoint being considered and gives the reader a sense both for the effect's size and its direction. It provides as much statistical information as the first example—in fact, more—but does so in a way that doesn't dwell on the unhelpful and often-confusing adjective "significant." Beginning each results paragraph with a clear topic sentence like that offered by the second example here makes it much more likely that the reader will understand and remember the study's main messages. In fact, the effective use of topic sentences allows the reader to discern a paper's main message quickly and easily, simply by reading the first sentence of each paragraph in the results section. Assume your readers are as busy as you are; make it easy on them.

4.3.4 Structure the Introduction and Discussion for Maximum Effect

We find that authors often are uncertain about what belongs in an introduction, what belongs in a discussion, and what doesn't belong in a paper at all. While every journal has its own house style—which includes not just formatting issues but also what kind of material goes in which section of the scientific papers it publishes—some general approaches serve well across the board. Here is one such approach:

Consider that the job of the introduction is to give the reader just enough information to allow him or her (1) to understand the importance of the topic, (2) to decide that reading on will be worth the time spent, and (3) to know precisely what questions the paper will answer. With that in mind, a short introduction—three paragraphs, one to meet each of those goals—usually does the trick in a straightforward clinical research paper. The first paragraph should convince the reader that the topic is important. While "important" will vary depending on who is reading (e.g., a great study on hallux valgus may not be important to a hand

surgeon), in general an author can establish importance of a paper by convincing the reader that it addresses a problem that is common, morbid, expensive, or difficult to treat. The second paragraph should focus on the study's rationale: the gap in knowledge that the authors set out to fill when they decided to begin the project or a controversy that the study might help settle. A compelling rationale paragraph will convince the reader that staying with you is worth the time (s)he will need to invest, which is no small commitment. Simply saying that a topic has not been reported on before may not itself be a convincing rationale; sometimes, topics have not been explored because they are unimportant or uninteresting. This is why it is effective to begin with a paragraph of background (why the topic is important) before pointing to the study's rationale (the gaps in knowledge of that topic the study will help fill). Finally, end the introduction with a short paragraph consisting of the specific research questions or purposes. If the rationale paragraph is written clearly, the last paragraph on research questions indeed can consist only of "We therefore sought to study…" and provide the specific, testable research questions.

Short introductions do not mean bloated, discursive, or ill-focused discussions. An effective discussion will (1) hook the reader, (2) cover the study's limitations, (3) compare the findings to others, and (4) wrap it up. A discussion might open with a paragraph where the background and rationale are briefly restated, followed by a short summary of the paper's main findings (some journals prefer that the questions are restated instead of the main findings—check out the target journal for house style on this point). A discussion section must cover a study's limitations; whether this is done in the second paragraph of the discussion or toward the end of it is, once again, generally a matter of that journal's style. Next, consider organizing the discussion around the research questions. A paragraph of discussion per research question is a good place to start (if the question was important enough to ask, it's important enough to discuss)—and often a great place to stop, since more than this can result in a reader losing track of what is important. Each discussion paragraph should compare the findings on one research question to other studies on similar topics and speak to the generalizability of those findings; once again, it helps the reader if this is done in the order those questions were asked. If the study's results are different from others, the authors should suggest why this might be—different techniques? Different study populations? Different analytic methods? If the results are similar to those reported by others, the authors should explain how the new work extends what is known or why confirming it merits the reader's attention. Finally, a good discussion section should conclude by helping the reader know what might be done with the results, how (if at all) the findings should influence practice, what unanswered questions remain, and how future studies might go about answering them.

Anything more than that—exhaustive literature reviews, summaries of related laboratory research findings in clinical research papers, facts the team finds interesting and learned along the way—need not appear in a clinical research paper. Save those for the review article.

4.3.5 Outline and Justify the Study's Limitations

By the time a clinician-scientist is writing up a paper, (s)he has spent months or years living with the project. Emotional bonds form. But like our friends and relatives—and like us—our papers have limitations. Good papers discuss these candidly. Simply listing a study's limitations, though, is not helpful; the goal of this section of the discussion is to justify those limitations, that is, to help the reader understand how each specific limitation influences the effect size, generalizability, or robustness of the main findings. A good way to do this is to focus on the main kinds of bias that commonly influence the research design that was used; the Centre for Evidence-Based Medicine offers some useful outlines of these topics [1]. Here, we will focus on three of the most common kinds of bias that influence the conclusion in the most common research design in orthopedic journals: the retrospective study on therapy [5]. Three kinds of bias beset papers of this design in almost all instances: selection bias, transfer bias, and assessment bias [6]. In retrospective observational studies, readers are concerned about these kinds of bias, and authors should help them understand to what degree the conclusions are compromised by them.

Selection Bias: Do the study's patients truly represent the patient population of interest, or were only the "easy ones" studied? In general, the effect of this kind of bias is to inflate the apparent benefits of newer treatments being studied.

Transfer Bias: Was the follow-up sufficiently long and complete to identify the outcomes (and complications or failures) of interest? As patients who are missing are more likely to have had an adverse event—failure, complication, or reoperation—the higher the proportion of patients lost to follow-up, the better the treatment being studied will look [7, 8]. A study reporting good results in 95% of patients but accounting for only 60% of the patients treated may indeed be misleading. This is especially important if the treatment groups suffered from differential loss to follow-up; if the treatment group has lost more patients to follow-up than the control group, the treatment will look better than it probably is.

Assessment Bias: Who assessed the outcomes, and how were they assessed? The answer to a well-constructed research question can be undermined or invalidated by improperly assessing the answers to that question. Assessment bias can occur when an interested party (e.g., the operating surgeon) performs the outcome measure assessments or if non-validated tools are used. Be especially mindful of studies that purport to assess "satisfaction"; this is notoriously difficult to evaluate [9].

4.4 Common Mistakes and How to Prevent Them

- *Don't ask vague research questions*. Avoid terms like "outcomes," "results," and "our experiences with," in favor of more specific study endpoints. Using the Centre for Evidence-Based Medicine's "PICO" tool (Patient, Intervention, Comparison, Outcome) can help, as well [10].

- *Don't confuse statistical significance and clinical importance*. There is little benefit—and much potential harm [11] to using the terms "significant" or "statistically significant" anyplace other than the statistical methods section of a paper. Readers who are not statistically savvy risk confusing the passing of a statistical test with the clinical importance of a finding. Some results are "statistically significant" because the study group is very large—indeed this is common with large randomized trials and national databases or registries—even though the effect sizes are small. Make no claims of difference unless those differences indeed have cleared the statistical hurdles set in the method's section, but once a difference has cleared that hurdle, focus on whether the observed difference is clinically meaningful. In the results section, concentrate instead on effect size, odds or hazard ratios, numbers needed to treat or harm, and other measures that allow the reader an intuitive sense for whether the observed differences were large or small. Consider framing the results in terms of the minimum clinically important difference (MCID), if it is known for the outcomes tool being used [12] and explain what it means if the observed "differences" indeed are smaller than the MCID, as this can completely change a study's conclusion. In the discussion section, indicate whether those observed differences are worth the inevitable trade-offs that arise in clinical medicine, like cost, risk, and uncertainty.
- *Don't waste your time—read the author instructions*. Read a journal's author instructions before submitting (or even writing up) your work for that journal. Make sure your work is within that journal's remit and that you've adhered to that journal's house style. Many journals offer templates that make writing to their style easier. Since their reviewers have grown accustomed to seeing manuscripts in that style, not adhering to it places your work at a severe competitive disadvantage in the review process.
- *Don't violate normative or ethical standards of scientific publishing*. Each journal has its own standards for such things as authorship, conflicts of interest, and redundancy; many better journals employ available and well-considered international standards, such as those articulated by the International Committee of Medical Journal Editors [13] and the Committee on Publication Ethics [14]. Be familiar with the journal's policies on these matters before submitting, familiarize yourself with the available guidelines and tools at www.icmje.org and www.publicationethics.org, and adhere to them. If in doubt, email your query to the journal's editor. Ghost or guest authorship, undisclosed or incorrectly disclosed conflicts of interest, and redundant publication ("salami slicing") will commonly result in a manuscript's rejection or worse. Errors in these areas can taint or ruin careers.
- *Don't overreach—present your conclusions modestly*. Few things turn a reader (or reviewer or editor) off more than an immodest or overstated conclusion. If you are uncertain about whether your study's conclusion paints within the lines, consider reading your paper to someone whom you know disagrees with your study's point of view, and be open to modifying things accordingly, since there is a good chance that one or more reviewers may not see things exactly as you do.

4.5 Take-Home Messages

- *Good science is about questions and their answers*. Ask clear, focused questions around specific, testable endpoints. Organize every section of the paper—methods, results, and discussion—around those questions.
- *Make sure your reader knows how the questions were tested*. Use STROBE, CONSORT, or PRISMA (whichever applies) to structure a methods section that is robust and easy to follow. Reassure the reader that the common kinds of bias identified in the Centre for Evidence-Based Medicine's "Critical Appraisal" tools [1] are not disqualifying flaws.
- *Present the results so simply that no one can misunderstand them*. Begin each results paragraph with a plain language summary sentence that a nonscientist would understand. Focus on the endpoint tested, the effect's size, and its direction, not "statistical significance."
- *Hook the reader with a background that demonstrates the study's importance and a rationale that convinces him/her that (s)he cannot afford to skip over the paper*. These elements are the "meat" of the introduction section and should appear again in the first paragraph of the discussion.
- *Be modest*. Present the study's limitations explicitly, and you make it clear how those limitations should influence the reader's understanding of the study's main findings. Indicate to the reader to what degree the work might—or might not—generalize to other patient groups or practice setting. Focus the conclusions on what was actually tested.

Acknowledgment The authors gratefully acknowledge Richard A. Brand, MD, whose efforts to refine and disseminate a question-driven approach to scientific reporting deeply influenced our own approaches and whose paper "Writing for *Clinical Orthopaedics and Related Research"* [15] is a must read, regardless of what journal one is writing for.

References

1. Oxford Centre for Evidence- Based Medicine. Critical appraisal tools. http://www.cebm.net/critical-appraisal/. Accessed 22 June 2015.
2. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. J Clin Epidemiol. 2008;61(4):344–9.
3. Schulz KF, Altman DG, Moher D, CONSORT Group. CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. Ann Intern Med. 2010;152:726.
4. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Ann Intern Med. 2009;151(4):264.
5. Wupperman R, Davis R, Obremskey WT. Level of evidence in Spine compared to other orthopedic journals. Spine. 2007;32(3):388–93.
6. Leopold SS. Editorial: let's talk about level IV: the bones of a good restrospective case series. Clin Orthop Relat Res. 2013;471(2):353–4.

7. Paradis C. Bias in surgical research. Ann Surg. 2008;248(2):180–8.
8. Pannucci C, Wilkins E. Identifying and avoiding bias in research. Plast Reconstr Surg. 2010;126(2):619–25.
9. Ring D, Leopold SS. Editorial: measuring satisfaction: can it be done? Clin Orthop Relat Res. 2015;473(10):3071–3.
10. Oxford Centre for Evidence- Based Medicine. Asking focused questions. http://www.cebm.net/asking-focused-questions/. Accessed 22 June 2015.
11. Leopold SS. Editorial: words and meaning in scientific reporting: consecutive, prospective, and significant. Clin Orthop Relat Res. 2013;471(9):2731–2.
12. Schiffer G. CORR insights: the minimum clinically important difference of patient-rated wrist evaluation score for patients with distal radius fractures. Clin Orthop Relat Res. 2015;473(10):3242–4.
13. International Committee of Medical Journal Editors. Defining the role of authors and contributors. 2014. http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html. Accessed 21 June 2015.
14. Committee on Publication Ethics. Guidelines. http://publicationethics.org/resources/guidelines. Accessed 29 Sept 2015.
15. Brand RA. Editorial: writing for clinical orthopaedics and related research. Clin Orthop Relat Res. 2008;466:239–47.