
MEDICAL EDUCATION

How to write a scientific paper – a rough guide to getting published

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This is the third article in a series on medical education.

Few professional experiences are more depressing than having your first attempt at writing an original article rejected. The process of peer review can be very cruel when your fledgling efforts are summarily dismissed with comments that they ‘add little to current knowledge’, that your conclusions are ‘not supported by the data presented’, or worse still that the writing is ‘confusing and verbose’. So how can the chances of this happening be minimised?

Scientific writing is constrained within certain conventions. The report of any study should contain an Introduction (why what was done was done), a Methods section (what was done), a Results section (what was found), and a Discussion (what the results mean, what else has been published on the topic, and what’s new). There should also be an abstract or summary at the beginning distilling the essence of the paper, and a list of references at the end together with any tables or figures.

A full paper should normally be no more than 2000 words long, which is roughly 8–10 full pages of double spaced manuscript with wide margins. Abstracts should normally be no more than 250 words. Tables and figures should be kept to the minimum necessary to display results clearly, and should not repeat data described in the text. Exactly how manuscripts should be laid out for any particular journal (width of margins, style of citing references, layout of tables, preferred figure sizes, and the like) is described in each publications’ ‘instructions to authors’. These can be irritatingly variable, but thankfully many of the more respected journals (including this journal) now subscribe to a common set of requirements originally agreed by a group of medical editors in Vancouver in 1978.¹

But all this merely tells the aspirant author the basic rules of the game. It offers no help on how to play it well, and gives away no tricks of the trade. For that we need to go beyond Vancouver.

(1) Should you start?

Too often articles are prepared that really say nothing new, interesting, or important. Anyone inclined to try the silk purse/sow’s ear trick should remember that if a paper is not

worth writing, it is not worth writing well. Be honest with yourself at the outset. If in doubt, take disinterested expert advice.

(2) Time

It takes a lot longer than most people realise to write a scientific report. If you consider your whole study as a pregnancy, the production of a final manuscript will occupy most of the third trimester.

Those who think that data collection is everything and that a paper can be cobbled together over a weekend invariably discover otherwise. There are always supplementary analyses to do, new references to read, tables to compile and redesign, and graphs to draw and redraw. Even after the prolonged pain of producing a complete first draft, the initial manuscript should still be regarded as a rough diamond, ready for extensive cutting and polishing.

(3) Clarity and brevity

Brief, clear prose is easy to read but very hard to write. Whoever penned ‘please excuse this long letter but I have not had time to write a short one’ said it all. There is a tendency for tyro scientific authors to be pompous and wordy, and to go to such lengths to avoid imprecision and ambiguity that all meaning is eventually obscured.

Short sentences and simple ordinary words should be used wherever possible. Rather than ‘*Physical examination revealed that the patient displayed a generalised erythema together with a marked tachycardia and tachypnoea though pyrexia was conspicuous by its absence*’ say instead ‘*The child was flushed with a rapid pulse and respiration rate but no fever*’. Or in place of ‘*Of 214 unselected children with Rare’s disease accrued during the study period, 14 were excluded because of prior therapy elsewhere, 12 were excluded due to a change in the diagnosis, and seven were excluded because they came from another region*’ prefer ‘*181 regional children with confirmed and untreated Rare’s disease were seen during the study*’. A good test of clear text is to read it aloud.

(4) Style

To some extent style is governed by the journal

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in question, and most of the important ones will have technical copy editors who may viciously attack what you thought was deathless prose. This ensures a degree of uniformity of house style as well as sorting out misplaced pronouns, problems with participles, noun salads, and the like. Most of the changes are for syntax, clarity, and precision and are genuine improvements.

Style, though, is a personal thing which is why authors sometimes get upset after copy editors have altered their efforts. It is difficult to give guidance other than to strive always to be clear and succinct, to avoid clichés and jargon wherever possible, and to keep to a minimum the use of abbreviations, especially those that might be gratuitously created solely for the paper in question (*Children with chronic sinusitis (CWCS) were given intranasal domestomycin (IND) thrice weekly*).

(5) Components of the manuscript

(A) THE TITLE

Take time on it because the title of a paper is important. It is the first thing potential readers see and what makes them decide to read more of your article – or not. It should consequently be as punchy as possible. It should convey simply what the paper is about rather than describing its detailed contents. Avoid trying to cram too much in (*A randomised double blind placebo controlled trial of the use of varying doses of intranasal domestomycin in patients with chronic sinusitis*). Ruthlessly prune unnecessary words and keep it as short as possible (*Intranasal domestomycin in chronic sinusitis*). Do not offer conclusions (*Intranasal domestomycin is effective in chronic sinusitis*), though occasionally questions are permissible where the topic is controversial (*Is intranasal domestomycin useful in chronic sinusitis?*).

(B) THE ABSTRACT

Apart from the title, it is a depressing but true fact that the abstract is the only part of your paper that most people will ever read. Also an editor may be influenced by it in his choice of referees. So it is worth sweating over. Abstracts should be clear, complete, and informative in their own right. The components of the main paper should be echoed in summary fashion with a sentence describing why you did what you did followed by a brief description of your study design, a synopsis of the results, and a clear what-it-all-means message at the end. Some editors require formal ‘structured’ abstracts with subheadings like ‘aims, methods, results, conclusions’, but these should be easy to accommodate in a well written example.

Because they are so important, abstracts should never be rushed or skimmed. On a time-per-word basis they ought to be the most labour intensive part of the script. Whether they are written first or last is a matter of taste. I prefer first, as it focuses thought onto the bare bones of what the paper is about.

(C) THE INTRODUCTION

Here the reader needs to understand the background to your study. You should clearly and briefly state why you did what you did and why it was a worthwhile thing to do. In specialist journals some knowledge of your subject can be assumed, but in general publications, such as the *Lancet*, it cannot. Introductions do not normally require an extensive literature review, but a few key references might help.

Be simple and straightforward. *‘It is widely believed that’* is not a fair comment when one obscure publication from 20 years ago made a claim that you are about to demolish, and *‘much recent interest has centred around children with chronic sinusitis’* is unconvincing if you are the only person to have published on the topic in the last decade. No need to impress. Just try to leave the reader interested, informed, and ready for what follows.

(D) PATIENTS AND METHODS

Describe the patients you studied (not the numbers, but how they were selected or recruited). Indicate what made them eligible or ineligible. Explain how they were treated, what you did to them, and how you measured what you measured. If relevant, describe the technical aspects of any new physiological or laboratory test, or, if the details are long and tiresome and have been already published, cite the source and give a synopsis only. Mention any statistical methods used and make sure they are appropriate. Satisfy the sceptical reader that you designed your study well, and do so in as few words as possible.

(E) RESULTS

Dispassionately describe the information you collected and its subsequent analysis without any attempt at interpretation. Avoid qualifying adjectives implying opinion (*‘there was a huge excess of patients with sinusitis’*) and leave conclusions (*‘it was clear that domestomycin was effective and well tolerated’*) to the discussion. Present figures in the clearest way possible, by tables or graphs as appropriate. Give results once only and do not duplicate in the text what you show in a table or graph. Try to avoid enormous complicated tables. When tempted by your computer software package to draw a fancy three dimensional histogram, reflect whether a table (where precise figures can be seen) would be better.

Where statistical significance is indicated, quote not only the p values but the value of the statistical parameter (*r*, *t*, *u*, χ^2 , or whatever) and the 95% confidence intervals as well. There are ways to do so for virtually all analyses.² Confidence intervals give a far better indication of the statistical reliability of your results than bald p values.

(F) THE DISCUSSION

The hardest section to write after the abstract, the discussion provides an opportunity to deliver your message. But be careful. Do not

draw unsupported conclusions. Say just what your findings mean, not what you would like them to mean or think they ought to mean. Then point out the novelty of your observations – such as it is. Compare your results with those of others who have done similar work before, and search the literature carefully. It is a fair bet that someone, somewhere had the same idea before you, but this does not make your work worthless. Simply go over the points of similarity and difference and, if your results are totally different, speculate why. Help the reader to avoid confusion by reaching some overall conclusion when considering your findings along with those of others. Finish with an ‘on balance’ view.

Avoid overstatement and exaggeration. Be neutral or understate. *‘These exciting findings demonstrate convincingly that domestomycin cures chronic sinusitis’* is less impressive than *‘99% of domestomycin recipients cleared their sinuses within three days compared with 2% of those receiving placebo. Given in the way described it seems that the drug is effective’*. And try not to meander. Marshall your thoughts and arguments logically. Cut and paste (manually if necessary) to get things in the best order. Finally make clear how your work might influence clinical practice in future, and try to avoid ending with a whimper like *‘these preliminary findings will need to be confirmed by others’* or worse *‘further work is necessary to answer the questions raised in this study’*.

(G) REFERENCES

Keep the list short. There are no prizes for quantity, and copy editors will curse you. Cite

only those that are directly relevant to your work, and those that will allow the interested reader entry to the core literature of the topic. Prefer source or recent review articles rather than textbooks, and, where you have a choice, quote widely accessible journals rather than obscure publications. Some editors do not allow published abstracts as references.

(6) And finally

When you have finished, put the manuscript aside for a week. Then read it again, and get a friend to do the same. Make final polishing alterations. Check all the details accord with the author instructions, and write a brief covering letter to the editor (by name) explaining why you are submitting the paper to his particular journal. And if your masterpiece is rejected, don’t bleed. Consider the referees’ or editor’s comments. If they have misunderstood your message it is almost certainly your fault for not making things clear. Calm down, take as objective a view as possible, recast the whole thing if necessary (it almost always is), and, like thousands before you, send it somewhere else.

Take heart. The *BMJ* ran a study in 1979. Although 1223 of 1551 consecutive papers were rejected, at least 836 of them eventually got published elsewhere,³ so the odds are on your side.

- 1 International Committee of Medical Journal Editors. Uniform requirements for manuscripts submitted to biomedical journals. *N Engl J Med* 1991; 324: 424–8.
- 2 Gardner MJ, Altman DG. *Statistics with confidence*. London: British Medical Journal, 1989.
- 3 Lock S. *A difficult balance; editorial peer review in medicine*. London: Nuffield Provincial Hospitals Trust, 1985.