Education

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HINTS ON WRITING FOR PUBLICATION

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Planning

Before starting to write, take some time to plan your work. Whatever you are writing, be it a clinical paper, an editorial or a review article, it should have a clear message. If you do not have something to say, then you should not be writing. So you should start by getting your message clear in your own mind. It may be helpful to write your message down on a separate piece of paper before you begin writing the article. Your message should be only one sentence long. If you tend to write too much and find yourself straying from the key message, write it on a 'Post-it' note and stick it somewhere you can see it as you write.

Next, take a moment to think about your potential readers. Your style, and the information you include, should reflect your target audience. Think about what might interest your readers, what they already know and what they need to know to understand your paper.

Now, plan your article carefully. Creating a 'mind map'[1] or list may be helpful if you have a lot of topics to cover. A detailed plan of the sections may also be helpful, especially if you are not following the traditional 'IMRAD' structure (which stands for Introduction Methods Results And Discussion) of a typical scientific paper. Give particular care to the structure and logical flow for review articles and longer publications.

Lastly, check the requirements of your target journal. It is a waste of time to write a long piece only to find it exceeds the maximum size accepted by a journal, or to have to spend time changing the style (e.g. of the references) after you have started writing. It is therefore much better to choose your target journal before you start to write, and to familiarize yourself with its instructions in advance.

Order of writing

This choice depends on personal preferences, but, if you are reporting a clinical trial, it is usually easiest to start with the Methods section. This technique is especially helpful if you find writing stressful or suffer from 'writer's block' and don't know where to start. The Methods is usually the easiest section to write because it should be based on the protocol. If you have a good protocol (which is essential for any research), then writing the Methods will simply be a case of deciding what to include then converting the protocol from the future tense (e.g. pregnant women will be excluded) to the past tense (pregnant women were excluded from the study).

Writing the Methods should get you into the flow of writing and remind you of the important aspects of the study design. The next section to tackle is usually the Results (both the text and any tables and figures). This should mirror the Methods, so it is good to write them as a pair. For example, you do not need to include any parts of the Method that you do not mention in the Results. Conversely, you should not include any measurements in the Results that you have not already described in the Methods.

The next pair to tackle is the Introduction and Discussion. Once again, these should relate to one another, so, while the Introduction should pose questions, the Discussion should answer them. Lastly, pull everything together in the Abstract and sort out all the other sections such as the Acknowledgements, title page and references.

Despite recommending that you write the Methods first, I will now consider each section in the order in which it usually appears in a publication.

The Introduction

The most common fault with Introductions is that they are too long. The Introduction for a journal paper should not be like the introduction to a thesis. The purpose of a paper's Introduction is simply to interest the reader and explain, briefly, why you did the research. This may involve explaining why the problem is important – but always keep your audience in mind and remember what they already know. For example, if you are writing for psychiatrists you do not need to tell them that schizophrenia is a serious mental illness: they already know this. The last sentence of the introduction often summarizes the study question or hypothesis. Try to grab the reader's attention with your first sentence – a statistic about the clinical, social or economic impact of the condition you are studying, or a statement of a clinical problem or area of uncertainty can be good openers.

The Introduction usually contains some references – but this is not the place to attempt to cover the whole literature surrounding the subject. Remember you are not writing a dissertation (where the purpose of the Introduction is to show how much you have read) but trying to give enough background for readers to understand your research question. If a review article (ideally, a systematic review) covers the area, then this makes an ideal reference for setting the context of your research. One useful hint in determining how many references to include is that you need just enough so that the reader understands your research question and why you did the research.

The Methods

This section should be rooted in the protocol, however, you must also describe any aspects of the study that did not go according to plan, especially if something changed part way through the trial (e.g. if inclusion criteria were changed). The most common complaint about the Methods section is that it does not contain enough detail. The easiest way to ensure a high quality Methods section is to follow the CONSORT statement guidelines (available at www.consort-statement.org) which includes a helpful checklist. Over 500 medical journals have endorsed the CONSORT statement and ask authors to follow it but, even if you are writing for a journal that does not require this, following the guidelines should ensure that you do not omit important details from your Methods section.

You should provide enough detail so that your study could be replicated. This will include details about the type of patients you studied (e.g. inclusion and exclusion criteria), how the condition was defined and the setting of the research (e.g. primary care clinic or in-patients). You also need to give very specific details of assessments, such as exactly how and when they were made. If you used previously published rating scales you should reference these, but, apart from this, there are usually no citations in this section. Most studies need some statistical analyses, and these should also be described.

The Results

This section needs careful planning. While the Methods section often describes the chronological progress of a study, you need to consider the most logical way of presenting your findings, which may not necessarily be in chronological order. Another important decision is between presenting data in text, tables and figures. Journals do not permit you to duplicate information between these different forms, so you must choose which technique best suits your various findings. Tables are very helpful for comparing two or more groups. Tables also allow considerable numerical detail (such as point estimates plus measures of variance, such as confidence intervals) which would be hard to read in continuous text and would make graphs cluttered.

I prefer to state my main findings in words, and put detailed numerical presentations in tables. Figures (such as graphs) can be useful to show changes over time, or to display large numbers of data points (e.g. a scatter graph, which could not be shown as a table). However, they take up more space than text and should not be used to present very simple data. Tables also have the advantage over graphs that they provide actual values, whereas these may only be inferred from graphs (see Table 1 and Figure 1 for examples).

A helpful format for the Results is to start by describing your patient population at baseline (i.e. before treatment), then describe the changes seen after treatment. First describe the primary outcome, then any secondary outcomes or unexpected findings. Always give actual numbers as well as percentages. In large or long studies where the number of patients varies at different time points, a flow chart showing patient disposition through the study can be very helpful. This is sometimes termed a CONSORT diagram, because the CONSORT statement provides a template for this and encourages its use (Figure 2).

For case studies and some types of trial, images such as X-rays, CT scans or ECGs may be helpful. If using images of patients ensure all identifying features are removed (e.g. block out patient names from scans) and always obtain permission from patients before publishing photographs.

Table 1: Sample Table (quality of reviews produced by reviewers who had been suggested by authors or chosen by editors)

	Author-nominated reviewers (ANR)	**Editor-chosen reviewers (ECR)**	***p*-value**
N	100	100	
Mean RQI* (±SD)	2.24 ± 0.55	2.34 ± 0.54	0.18
Tone	2.72 ± 0.48	2.82 ± 0.52	0.94

* Review Quality Instrument. Taken from: Wager E, Parkin EC, Tamber PS. Are reviewers suggested by authors as good as those chosen by editors? Results of a rater-blinded, retrospective study. BMC Medicine 2006, **4:**13

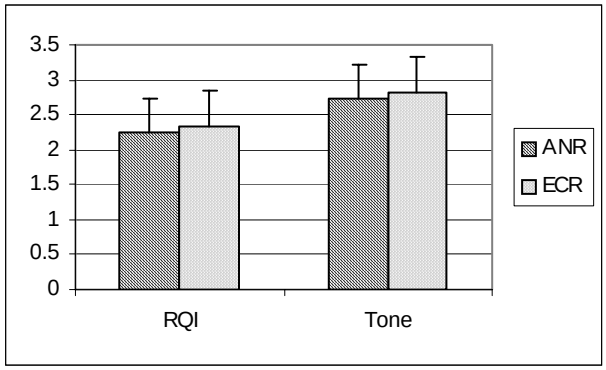

Figure 1: Data from table 1 displayed as a figure. Note the loss of precision. This figure is less informative than the table and wastes space because actual values need to be repeated in the text

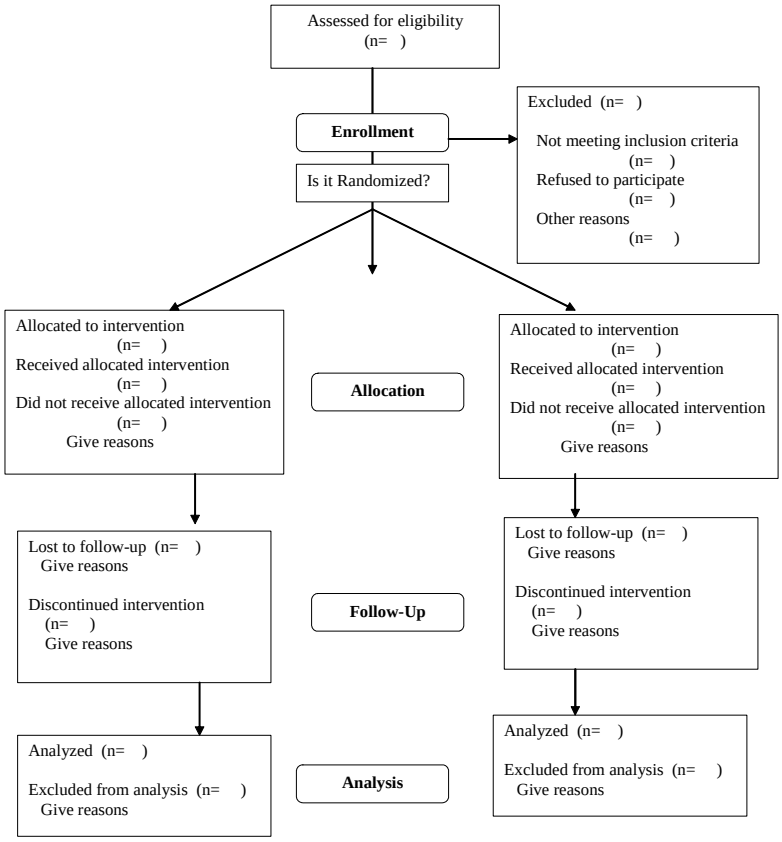

Figure 2: CONSORT diagram**.** Taken from http://www.consort-statement.org/Downloads/flowchart.doc

The Results section should contain no interpretation, and no references. You should simply describe your own work, not anybody else's. If you find yourself tempted to include a reference, this means you have probably started to write ….

The Discussion

While the detailed findings should go in the Results, a good way to start the Discussion is to sum up (in just one or two sentences) your key findings. You should not introduce new findings that have not already been presented in the Results section. The first few lines of the Discussion should also mirror the last few lines of the Introduction. For example, your Introduction might end with a phrase 'We therefore studied the effects of oral iron supplementation on the intellectual development of infants in Nigeria' and your Discussion might open with the phrase 'Our study suggests that oral iron supplementation may enhance the intellectual development of infants, as shown by higher mean IQ scores after 12 months compared with the placebo group'.

After summarizing your key findings, you should compare your results with previous studies. Once again, if there has been a systematic review of the topic this will be very helpful to explain how your results add to the sum of knowledge. Some journals (e.g. the *BMJ*) include a section on 'what was already known' and 'what our findings add' – even if you do not write these as separate sections they are helpful concepts to keep in mind when writing the Discussion. If your findings vary from previous studies you should offer explanations and interpretations (e.g. Smith et al showed no effect of oral iron on children in America, but this may be due to differences in national diet and calorie intake).

Other sections

Check your target journal's instructions before writing the abstract, since structures and word limits vary considerably. Remember if you change anything in the body of the paper in later drafts to change it in the abstract as well. The abstract and the main body of the paper must be consistent. No findings should appear in the abstract that do not appear in the rest of the paper.

Some journals require authors to provide key words and a short title (sometimes called a running head) (this will appear in the header on pages after the title page, sometimes alternating with other details such as the authors' names).

Pay attention to the title of your work. Protocols and grant applications tend to use very long titles which are not suitable for publications. Titles should be short but informative and should contain key elements of a study design (e.g. if it was a randomized trial, or an in vitro study). Cochrane reviews use a simple format of Treatment X for Condition Y (e.g. Fish oil for schizophrenia). This has the advantage of brevity and also of putting the important features at the start of the title rather than burying them within it. This is helpful since otherwise most titles would start 'A randomised controlled trial of …' If your study has an acronym or abbreviation, it may be helpful to include this in the title, especially if you plan to produce several publications.

Do not ignore other sections such as the Acknowledgements and statements of funding source and competing interests. If you received support for a study or publication (e.g. funding, drugs, or help with writing or data analysis) it is important to acknowledge these.

Check what details the journal requires on the title page (e.g. full names of authors, highest degrees, word count). The title page (showing the title and authors' names should usually not contain any other parts of the paper (i.e. start the abstract on a new page) since many journals remove the first page so that the authors' identity is not revealed to the reviewers. For this reason you should not use the authors' names in page footers.

Preparing the references can be hard work, but some of this can be relieved by using bibliographic software (such as EndNote[2] or Reference Manager[3]). Such software is particularly useful if you need to reformat your references, or have to renumber citations after adding an extra one. Pay attention to reference accuracy -- several studies have shown that many citations in medical journals are inaccurate and such errors may prevent readers from locating the cited reference.[4]

Figures

Check the journal's instructions for acceptable formats and leave plenty of time to prepare figures. Legends for photographs should be supplied at the end of the paper. Mark photographs (on the back with soft pencil) with the author name, figure number and orientation (unless this is obvious).

Covering letter and submission package

Your final writing task will be to prepare a covering letter and the paperwork required by the journal for submission (e.g. statements of authorship and copyright transfer forms). Take care over your covering letter.

Summarize your study in one or two sentences and your key findings in a further one or two (no more). Then give the editor a reason why your paper is suited to that particular journal. Many journals now accept electronic submission -- check the instructions for requirements as these vary between journals, especially the file formats for figures.

Editing, checking and collaborating

Most publications involve more than one person so you will need to work out the best way to work with your co-author(s), exchange ideas, make comments on drafts and approve the final version. When everybody has made their contributions you should read through the entire paper again, to check for consistency. If you are writing in a language that is not your native tongue, try to get a native speaker to check the paper for you and correct any grammatical errors. It is also helpful, even if you are writing in your own language, to get a colleague who was not involved with the research, but is somebody you respect and trust, to read the paper and tell you if anything is unclear or confusing. Ideally, choose somebody who belongs to your target audience, especially if this is a different discipline or specialty from your own. Finally, make sure you have permission to submit the paper from your funder, boss, head of department, or whoever needs to give approval.

Conclusion

Practice will improve your writing, and the more you write the easier you should find it. Reading other authors and observing their style can also be helpful. Remember your aim should be to get your message across to readers, not to show off, or to produce a literary masterpiece. Aim for clarity and simplicity. Avoid pomposity and unneccessary jargon. The ancient Chinese writer, Lu Ji (who lived from 261-303) noted *"Writing is joy – so saints and scholars all pursue it …With heaven and earth contained in your head, nothing escapes the pen in your hand"*. May your writing be truly joyful!

Further reading

Many books have been written on this topic, so the following is a personal selection of my own favourites:

Huth, E. J. (1999). Writing and Publishing in Medicine, 3e. Williams & Wilkins, Baltimore, USA

Hall, G. M. (1998). How to Write a Paper 2e, BMJ Books, London, UK

Fraser, J. (1997). How to Publish in Biomedicine: 500 Tips for Success, Radcliffe Publishing, Abingdon, UK

Goodman, N. W. and Edwards, M. B. (1997). Medical Writing, a Prescription for Clarity, 2e, Cambridge University Press, UK

References

1. http://www.mind-mapping.co.uk/
2. http://www.endnote.com/
3. http://www.refman.com/
4. Wager, E and Middleton, P. (2003). Technical editing of research reports in biomedical journals. Cochrane Database of Methodology Reviews, 2003, Issue 1.Art. No.: MR000002. DOI: 10.1002/14651858.MR000002.