PROFESSIONAL DEVELOPMENT

Tips on Writing a Scientific Paper

By
Egyptian Group for Surgical Science and Research
Said Rateb, EGSSR Moderator
Nabil Dowidar, EGSSR Secretary General
Mohamed Farid
Ahmed Hussein
Ahmed Hazem

Writing a scientific article is never easy - even for the most experienced. It is time-consuming and, almost without exception, hard work. Nevertheless, it should be an enjoyable challenge. Only when published can one's thoughts and ideas, findings, conclusions and suggestions reach other surgeons and clinical scientists. Any article - no matter how 'low key' at the time of its publication - becomes part of the 'body of scientific knowledge', forever available to others to read, reread, refine, accept or reject.

This year the Egyptian Group for Science and Surgical Research will publish four articles in The Egyptian Journal of Surgery covering the essential points on how to write a scientific paper. We hope these articles will facilitate and ease the task of writing your research results and help in its acceptance for publication.

Any article to be available for reading and dissemination it has to be published first. This process requires that the article be constructed in an approved manner and presented to the highest possible standards. The basic structure of a scientific paper is summarized by the acronym IMRAD which stands for:

Introduction	Why?
Methods	How?
Results	What?
And	
Discussion	However.....Therefore

However, it is advised before embarking on writing your paper to consult the 'Instructions to authors' of the journal you would like to submit your paper to for its specific requests. A scientific paper, nowadays, is usually presented in the following format:

Title page
Abstract
Introduction
Methods
Results
Discussion
Acknowledgements
References
Tables (including table titles)
Legends to illustrations

It would seem logical to start with the introduction because it forces you to put into words why the study was carried out and why you believe your findings are worth reporting. For some, it may be the hardest place to start and many would advise to start by committing the factual information (methods and results) to the paper first.

The first sentence is always the hardest: start with the aspect with which you are most comfortable. Remember, this is the first draft of your article; to attempt to achieve perfection at this stage is impossible and time should not be wasted at this initial stage on details of style, refinement of sentences, or choice of words.

The general purpose of each of the sections of an article can be summarized as follows:

THE ACTUAL PAPER

Title page

The title page should state the title of the paper, authors and their various institutions and lastly the name and address of the corresponding author who will be responsible for all future correspondence related to the paper.

A title should convey information on the research question, area of research, and the research method. Try to be brief, maximum information in fewer words, do not exceed 12-15 words. Avoid excessive adjectives and noun strings.

List all authors (Initials of first names followed by family name). Start with authors who had more of a practical role followed by authors who had a more advisory role.

It is good policy to include in the authorship any individual who has contributed to the concept and design of the study, analysis and interpretation of the data, drafting the article or revising it critically

The abstract

Abstracts are summaries of the chief points of a study and should state why the study was done, what was done, what was found, and what was concluded. Every effort should be done to produce a good quality abstract as it is the 'shop window' through which you wish to sell your research to your fellow readers or as a 'carrot' which you hope will attract the readers to read the rest of your paper.

Recently, there has a trend towards a more structured abstract with several subheadings summarizing the whole paper in no more than 200 words. The commonly used sections are background, methods, results, and conclusions. However, it is important to follow the journal guidelines on these issues.

Introduction

The main job of the introduction is to tell the readers why you have undertaken the study. It should explain briefly the unsolved aspect of the subject of your investigation and should clearly highlight what you propose to do about it. Ideally, the opening of the introduction should be intelligible and interesting even to someone outside the field. It is unnecessary to present a chronological sequence of much of the previous work on the subject in question. You only need to mention those directly related to the problem your paper is addressing. It is good policy to write one sentence describing the study design. This could be written at the end of the introduction. Do not mention any of your results or conclusions in your introduction. Frequently the introduction is too long; many authors confuse the role of the introduction with that of the discussion section. Keep it short as readers can easily get bored and may never make it through to you important results.

Methods

The methods section should describe, in logical sequence, how your study was designed and carried out and how you analysed your data. Your description must be complete, even to the extent of being pedantic and boring. Sufficient detail must be provided so that others may replicate your investigation. A diagram or flow chart explaining the steps of the study will always be reader friendly. Writing this section in detail before embarking on the actual study guarantees its sound execution.

This section should cover the following whenever relevant:

Study design	Observational / experimental Retrospective / prospective Method of randomization Type of blinding Control / placebo
Clinical material	Patient population (definition, recruitment) Inclusion/exclusion criteria Patient characteristics (number, age, weight)
Experimental programme	Test procedure / surgery undertaken Details of procedure / surgery Test drug used (Company, City, Country) Details of drug dosage Variables / outcomes measured Order of measurements
Analytical techniques	Apparatus used (Company, City, Country) Calibration procedure and accuracy
Derivation of variables	Formulae and calculations used
Statistical methods	Sample size calculation Test(s) used Level of significance accepted
Ethical issue	Ethical approval Consent

Standard methods or those available in easily obtainable journals or books could be referenced. However, any modification of a standard method - no matter how trivial - must be described in detail.

The results

The results section provides the answers to the questions you, as the author, pose in the introduction. This section should be a simple factual record of your findings. But what you must avoid is what most readers dread: 'The results are presented in Tables I to III or in the following figures'. This does not guide the readers into discovering what you want them to find but actively encourages them to find things you do not think important. You must lead your readers into following your thoughts, usually by using a mixture of text, tables, and illustrations. However, duplication should be avoided. The text should highlight the results, the tables should present the actual numerical information, and illustrations or graphs should be used to demonstrate relationships which cannot readily be seen from an inspection of the tables. In general terms, tables are popular because they enable the interested reader to recalculate the results and verify the conclusions.

First, you will need to describe the subjects and groups of your study in enough detail for the readers to assess how normal or abnormal they were. Readers need to compare these with their own subjects.

Second, you will need to present your answers. Start with some text as the readers can follow it as though they were reading a story. So start at the beginning of the study and go logically to its end. Use the tables to present the core (meat) of the results and to establish the statistical validity of your conclusions. Do not make the tables large or complex as even simple tables are sometimes hard to read.

The final part of this section can be use to present any unexpected results and state their statistical significance.

When presenting numerical data use one type of central tendency with its corresponding dispersion such as mean with standard deviation or median with 95% confidence interval, which will depend on the type of data available (normally

distributed or not). When describing differences in values between groups make sure you clarify whether they are mere mathematical or statistical differences.

Tables, illustrations and graphs will be covered in more detail in the next issue of The Egyptian Journal of Surgery.

The discussion

The discussion should be a balanced and unbiased analysis of your results; that is, it should focus very precisely on the findings presented previously (under results). The discussion section is less rigid in format than the other sections in the article.

Nevertheless, this section must present a logical, coherent, and step-by-step consideration of the main findings of the study and those factors which, in your opinion, could have influenced the results. For example, could the results have differed materially if you had studied more patients? Were the entry criteria too lax and could that have biased the results? Was the apparatus used really able to measure accurately such low concentrations?

Once you have considered your opinion, it is only right that you now place your results alongside those of others who have undertaken similar investigations. How do your results stand? Do they support previously published data? Are they different and, if so, is there a reason for the disparity? In this context you must be realistic as well as honest. Select well designed studies for the comparison.

Now that the evidence has been presented and analyzed, you are able to reach a verdict. First, there is the verdict on the question posed in the introduction. This should be clear-cut: A is better than B or A is worse than B or A and B are the same. In the second place, you can also give a much 'softer' verdict; a view as to how the changes observed could influence clinical practice; in other words, the clinical implications of your findings. Finally, state your recommendations, as an expert in the field, on suggestions for future work in this area.

Acknowledgements

Acknowledge only persons who have made substantive contributions to the study. Obtain written permission from everyone acknowledged by name because readers may infer their endorsement of the data and conclusions.

References

References will be covered in one of the forthcoming issues of this volume of The Egyptian Journal of Surgery.

Tables

Tables will be covered in the next issue of The Egyptian Journal of Surgery.

Legends to illustrations

See next issue of The Egyptian Journal of Surgery.

Drafting

By this stage your **first draft** of the article is ready. However, it should be left aside for a while (two weeks). You should not look at it and, if possible, not think about it. When you come back to your manuscript to produce the **second draft** you should look at it critically and try to pretend that it has been written by someone else so you can pick up the various mistakes missed in the first draft The aim of producing a second draft is to check the content and structure of the article.

The process is repeated to produce the **third draft** which aims at revising the style of the article including the construction of the sentences, choice of words, and the correctness of the grammar.

The fourth draft of the article is produced after you consult your co-authors. Their comments should be considered carefully and you should accept gracefully positive suggestions which improve the clarity of the presentation or highlight an obvious deficiency you have overlooked. On the other hand, you should be firm with comments that are ill thought.

The **final draft** is produced after consulting a senior colleague, experienced in writing for scientific journals. After the article is refined according to the advice of the senior colleague and read carefully for the last time, you can mail it to the journal editor of your choice. Meanwhile, keep your fingers crossed!