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Research primer

Getting accepted – Successful writing for scientific publication: a Research Primer for low- and middle-income countries

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ABSTRACT

Clear and precise writing is a vital skill for healthcare providers and those involved in global emergency care research. It allows one to publish in scientific literature and present oral and written summaries of their work. However, writing skills for publishing are rarely part of the curriculum in the healthcare education system. This review gives you a step-by-step guide on how to successfully write for scientific publication following the IMRaD principle (Introduction, Methods, Results, and Discussion) with every part supporting the key message. There are specific benefits of writing for publication that justify the extra work involved. Any lessons learned about improving global emergency care delivery can be useful to emergency clinicians. The end result can lead to changing others' practice and pave the way for further research.

African relevance

- Clear and precise scientific writing is a skill that is vital for healthcare researchers.
- Publication provides authors with the opportunity to share their ideas and experiences, and educate others.

The International Federation for Emergency Medicine global health research primer

This paper forms part 13 of a series of how to papers, commissioned by the International Federation for Emergency Medicine. It describes the process of writing a scientific paper. We have also included additional tips and pitfalls that are relevant to emergency medicine researchers.

Background

Clear and precise writing is a skill that is vital for healthcare providers who conduct and publish research. However, writing skills for publishing are not always part of the curriculum in many healthcare education systems globally. The writing skills we learn during our formal education must be adapted in order to successfully prepare for publishing in the scientific literature and presenting oral and written summaries of our research. This review gives you a step-by-step guide on how to successfully write for scientific publication following the IMRaD principle (Introduction, Methods, Results, and Discussion) with every part supporting the key message.

Typically, there are two reasons to write a paper, the study or experiment is the logical next step in a line of investigation or prior studies have been somehow deficient in some way that the current study addresses.

As a researcher, getting your work published gives you the chance to share your ideas and experiences, educate others and establish yourself as leader in your area of research. Getting research published isn't easy, and having a guide to help you through the process can be beneficial.

Getting started

If you are a first-time author, it is important to consider what it might take to get journal readers interested in a paper. Before you start

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to write, have your target readers in mind. Start by thinking clearly who will be primary and secondary readers of the work and how they might benefit from learning about your work. This is also useful when selecting which journals to publish your work or where to present it. Publishing an article in a predatory journal implies that your research is not good enough to be published in a legitimate journal. Take the time to ensure the journal has a digital object identifier (DOI) or international standard serial number (ISSN). Check the ISSN or title of the journal and read reviews. You should also know the journal's impact factor. Always do research to confirm that the journal is a legitimate, high-quality journal. Think.Check.Submit is a website that has been developed by academic publishers and scholarly associations to help you choose a trusted journal for your article. Read the scope of the journal, as scholarly journals often have a niche under a broad discipline. Find a journal that is fitting for your area of research. The peer-review process can take months, therefore, it is crucial to choose the right journal. Before starting off on your manuscript, always read the journals instructions for author guidelines. It is one of the most important things you will do when preparing a manuscript for publication.

Choosing a title

The title sells the paper. Keep it simple, accurate, concise and avoid using abbreviations. Sometimes journals have author instructions for making titles. Write a title using keywords at the beginning that will echo throughout the manuscript—its primary concepts and variables, its headings and subheadings, and its tables and figures. Try to include in the title for clinical studies: setting, patients, intervention, comparator, endpoint and design when appropriate. The title must therefore convey to the reader, the problem and population investigated as well as the prospects of the study. Please include a verb; doing so infuses the title with meaning, clarity and power.

Avoid using wasted words such as “a study of,” “investigation of,” “development of,” or “observations on.” Readers understand that you would not be writing the paper unless you had studied, investigated, developed, or observed something. Similarly, avoid including adjectives such as “new,” “improved,” “novel,” “validated,” and “sensitive.”

There should only be one meaning to your title. A good practice is to show the title to colleagues who are not co-authors and ask them to tell you what message they take away from your words.

Writing the Abstract

The abstract is an important part of the scientific article. After the title, it is next most often read and frequently the only part of the article read or available. The abstract is usually written last after all the basic components of the paper have been written.

The abstract is a distillation of the four major segments: introduction, methods, results, and discussion. Each of these segments should be brief. Make sure your objective is distinct from the background in your introduction. The purpose of the study should be encapsulated in one or two sentences and should contain a statement of the hypothesis. The methods paragraph should include only an outline of the procedures and variables and should detail the study design. The results should report only the principal findings of the study. The conclusion in the abstract should match the conclusion in the article. It is often easiest to write the abstract once the manuscript has been completed.

Review author instructions to see if it should be a single paragraph or have structured headings. Try to avoid using abbreviations or define them if you do use them. Do not cite references.

The Introduction section

The purpose of the introduction is to prepare readers to understand your paper and to orient them to your research and the importance of it. This provides justification to readers for the problem and the rationale for the research question and methods you used. A three paragraph introduction is plenty for most topics. This should be written in the present tense. The first sentence of the first paragraph should pick up some or most of the words from the title. Articulate the issue your paper addresses within the first three sentences to satisfy the expectations of your readers and maintain their attention. The second paragraph should provide context and motivation for the current investigation including the unknown information (knowledge gap). The last paragraph of the introduction should open with the explicit statement of the overarching reason your study is needed, drawing from the preceding paragraph. Here you should detail what your research questions is, the hypothesis, and how you approached it. The FINER (Feasible, Interesting, Novel, Ethical and Relevant) criteria will help you to write good research questions [1].

The Methods section

This is the most relevant section of any paper. The methods section is also called the materials and methods, patients and methods, study design, or experimental section. This should be written in the past tense. The purpose of this section is to allow readers to judge the internal validity of your study. A good methods section allows someone to reproduce your study. However, a reasonable goal is to provide enough information to establish the adequacy of the methods to address the problem and, in doing so, your credibility as a careful and thorough researcher. If lengthy, the materials and methods section should be organized under subheadings.

You should indicate in the first sentence the overall design of the study. The choices are case report, case series, case-control study, cohort study, and clinical trial. You should also indicate whether the collection of data was retrospective or prospective. Next, indicate how the study group was assembled. Tell how your sample size was selected and if applicable, how the sample size was determined. This includes whether you used a convenience sample or consecutive patients and details of statistical power calculation that determined the target sample size. The demographics of the patient population should be written in the methods section if this is a retrospective study.

The methods should detail exactly what you did in the order in which you did it. The experiment should be described in steps, so that readers can reproduce exactly what you did if they so choose. The collection, safety monitoring, and validation of the data should be described with particular attention as to how the data quality is ensured, usually with blinding or intra- and inter-observer variability measures. Here too you should establish what constitutes truth in your study (i.e., your gold standard). If proof against a diagnosis is presumed by a lack of symptoms or manifestations, then it must be clear how long the subjects were observed. Avoid presenting actual data in this section.

Report the technical parameters you found in your template papers. For the equipment used, provide manufacturer's name and location (although some journals will edit this out as advertising). Avoid leaving any gaps in the logic of the methods. Complex methods can sometimes be described in an appendix or in supplemental information available on the journal website if needed. Operational definitions and criteria should be explicitly stated. The statistical tests should be discussed in the order in which they were applied to the data. The statistical tests should be described in the same order as the experiment was developed. Make sure predictor variables are clearly identified, and that the dependent variables (outcomes) are also identified.

Statements about informed consent and institutional review board approval belong here. If the study involves humans, provide a statement that the Institutional Review Board (or Ethics Committee) approved it or if the study involved animals, the Animal Care and Use Committee (most institutions in resource limited settings use the ethics committee for both humans and animals) approved it.

The last sentence of this paragraph should include a statement of what P value represents an acceptable level of statistical significance.

Traditionally, this value is 0.05, but if a different level is chosen (usually a more conservative one), then that should be stated and the reason given. Consult a statistician before embarking on a project, work with a statistician to analyze and interpret the data, and have a statistician reviewing the whole manuscript for clarity of statistical analysis and data presentation.

The Results section

The development of the results section should parallel that of the methods section. This section should be written in the past tense. If subheadings are used in the methods section, then the same subheadings should be provided in the same order in the results section. Again, you may choose to eliminate these subheadings, but the organization of the methods and results sections must coincide.

The purpose of the results section is to tell the reader what happened during the study and to report the findings, the data that was collected and their relationship. If there were protocol deviations or unexpected data losses, etc. then this should be discussed in this section. The biggest mistake authors make in the results section involves confusing data with information. Anything you measure can become data, but only data relevant to the objectives of your study can become information. Information is always useful; data may not be. You are not obligated to present every result from your study, only that which is relevant to the objective of your study as detailed in the introduction.

Be prepared to analyze more data as you write if necessary. You may also need to collect additional data as you write the results section. This is important when appropriate. Do not be afraid to do this in your haste to finish writing. If there is an important data point you did not collect, you should go back and collect it if possible.

Report the results section in figures and tables when possible and try not to duplicate too much of that information in the text. Within the text, focus the attention on the data given in the tables and figures. In doing this, describe the results rather than the figure or table. For example: “Figure 1 shows the decline in blood pressure”, instead say “blood pressure declined (Figure 2).” Report the data with appropriate descriptive statistics. Table 1 should describe demographics where applicable. Table 2 main results and figures should complement these. Measurements may need to be presented in *Systems Internationale* (SI) units if required by the journal. Do not include any conclusions in the results as that is best placed in the discussion.

For clinical articles, it is best to present baseline characteristics of the sample because they are the results of the sample selection process. Report the primary comparison results first and the other results of interest later. Make sure to report both statistically significant and insignificant results so your integrity is not questioned. Express P values as equalities ($P = 0.01$ rather than $P < 0.05$). The smallest P value that needs reporting is $P < 0.001$ (unless testing generic associations in which P values are reported several more decimal places). Many journals require 95% confidence intervals rather than or in addition to P values. We encourage you to adopt this approach and use confidence intervals over P values in your work, as they provide information about statistical significance, as well as the direction and strength of the effect.

Report the actual (absolute) change or difference between groups (“the estimated treatment effect”) and a 95% confidence article for each estimate. Be careful in reporting percentages, as in small samples they can appear large when reported this way. Be sure the numerator and denominator are easily identified.

Supplemental data

Supplemental data are those that cannot be included with the published article because of expense, quantity, or form but that nevertheless help document the research. Such data include large datasets (databases and spreadsheets), additional figures, video clips, program code and electronic graphics not suitable for print. Supplemental data must be relevant to the associated article, which in turn must be complete in and of itself; it must not rely on the supplemental data to make its points. Supplemental data must be referenced and described in the manuscript, be submitted at the same time as the manuscript, and may be included in the peer-review process.

The Discussion section

This section should start with a statement that clearly summarizes your study findings and addresses your study objectives. Next, place your research in context, interpret your results, and explain the implications and importance of your findings. You must be able to answer the two questions journal editors will ask: “So what?” (is this research new, valid, novel?) and “Who cares?” (who needs to know about it and why?)

Talk specifically about your principal findings, which will be the findings that address the questions posed in the introduction. References to data from the results section should be limited to the most important numbers. Do not present any new data that were not shown in the results section and avoid repeating data presentation. The next paragraph may describe the novelty of your findings or if they parallel previous research. A skillful selection of the most pertinent references demonstrates a command of relevant literature. You should also state whether your interpretations are in concert with those of other researchers. Your interpretations will represent either consistency with current thinking or a departure from current thinking. Clearly articulate the clinical implications of your findings. Make sure you indicate the strengths and limitations of your study. All studies have limitations. Authors who acknowledge these are seen as honest and careful researchers. Authors who do not acknowledge limitations are seen as careless.

The last paragraph should be a summary paragraph. First, restate your principal findings and conclusions. Describe each conclusion separately. Second, emphasize the clinical or basic science implications of your findings and the last sentence should describe the logical next step, if one is needed. If there is no logical next step, do not recommend that people do further studies if you think this line of investigation is going nowhere.

Tips on this topic

- Always read the journal guidelines for authors. Failing to read journal guidelines for formatting will only delay the process of review and potentially publication of your articles. Each journal has specific guidelines in how they want abbreviations, headings, tables, figures and the manuscript formatted. Be sure to avoid contractions and colloquial language. Failing to comply with these may result in your article being returned to you.
- The title and abstract are the two most important pieces to your article. Ensure the title is accurate, concise and free of abbreviations, and the conclusion in the abstract is identical to the one in your manuscript conclusion. It is often easier to write the abstract after the manuscript is complete.
- Write a FINER research question. **Feasible** - do you have an adequate number subjects and adequate technical expertise. Is it affordable in time and money and manageable in scope. **Interesting** - Getting the answer intrigues the investigator and colleagues. **Novel** - Confirms, refutes or extends previous findings or provides new findings. **Ethical** – Amenable to a study that the institutional review board will approve. **Relevant** - To scientific knowledge, to clinical and health policy or to future research [1].
- Make your conclusion factual, based on your results and state it succinctly. Do not overstate your conclusion or write speculation.
- It is rare for manuscripts to be accepted for publication without revisions. Make sure you have addressed all the issues raised by

peer-reviewers prior to resubmission. It is ok if there is a revision concern you are not able to complete; however, you must reply why you are unable to complete the requested revision.

Pitfalls to avoid

- Weak background and problem statements are the most common shortcomings of introductions.
- Confusing data with information. Anything you measure can become data, but only those data that have meaning can become information.
- Making multiple statistical comparisons between baseline characteristics of your control and study groups. Your sample size is unlikely to be adequate to make meaningful inferences between groups.
- Writing a manuscript around a significant P value. Make sure you answer your research question (s) in the discussion and discuss the implications rather than just repeating the results.
- Rejections are part of the process. It does not mean the end of your career. If your paper isn't the right fit for a journal and you have received feedback, carefully consider making those changes which will strengthen your paper. Consider resubmitting your paper to another journal. Many authors have had their paper rejected one or more times and were ultimately successful in publishing their work.

Annotated bibliography

1. *How To Report Statistics in Medicine* is a comprehensive guideline for how to document research design as well as activities for randomized controlled studies, cohort and longitudinal studies, case-control studies, systematic reviews and meta-analysis, economic evaluations, diagnostic test characteristics, decision analysis, surveys and cross-sectional studies, time-to-event (survival analysis), decision analysis, and clinical practice guidelines.
2. Checklists for reporting specific types of research have also been developed. These can be accessed through the Mulford Library website or from the EQUATOR Network website. These include:
   a. CONSORT Statement for randomized controlled trials and the extension of this statement for nonpharmacologic treatment [2,3]
   b. STROBE and TREND Statements for observational studies [4,5]
   c. QUOROM (PRISMA) and MOOSE statements for systematic reviews and meta-analysis [6,7]
   d. STARD checklist for diagnostic test development [8].

The American College of Emergency Physicians has a resource called Emergency Care Research: A Primer. This resource gives fundamental principles for conducting and disseminating research.

Additional relevant information to consider

Research teams

One individual cannot produce a good scholarly scientific publication. It is therefore important to form research teams based on the subject being investigated. A Biostatistician is a key member of every team irrespective of the subject being investigated. Early discussions with the biostatistician during the research design phase will avoid many headaches related to analysis after data collection.

Authors' contribution

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: ES contributed 70%; MO, BWW and JK contributed 10% each. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of competing interest

The authors declared no conflicts of interest.

References

[1] Hulley S, Cummings S, Browner W, et al. Designing clinical research. 3rd ed. Philadelphia (PA): Lippincott Williams and Wilkins; 2007.
[2] Boutron I, Moher D, Altman DG, Schulz KF, Ravaud P, CONSORT Group. Methods and processes of the CONSORT Group: example of an extension for trials assessing nonpharmacologic treatments. Ann Intern Med 2008;148(4):W60–6.
[3] Moher D, Schulz KF, Altman DG. The CONSORT statement: revised recommendations for improving the quality of reports of parallel-group randomised trials. Lancet Lond Engl 2001;357(9263):1191–4.
[4] von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. PLoS Med 2007;4(10):e296. https://doi.org/10.1371/journal.pmed.0040296.
[5] Des Jarlais DC, Lyles C, Crepaz N, TREND Group. Improving the reporting quality of nonrandomized evaluations of behavioral and public health interventions: the TREND statement. Am J Public Health 2004;94(3):361–6.
[6] Moher D, Cook DJ, Eastwood S, Olkin I, Rennie D, Stroup DF. Improving the quality of reports of meta-analyses of randomised controlled trials: the QUOROM statement. Quality of reporting of meta-analyses. Lancet Lond Engl 1999;354(9193):1896–900.
[7] Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. JAMA 2000;283(15):2008–12.
[8] Bossuyt PM, Reitsma JB, Bruns DE, et al. Towards complete and accurate reporting of studies of diagnostic accuracy: the STARD initiative. BMJ 2003;326(7379):41–4.