Art and science of authorship for biomedical research publication

SS Harsoor
Director of Medical Education, Karnataka, Bengaluru, India

ABSTRACT

Completion of research is logically followed by process of submission of the outcomes for publication. The objective of this article is to sensitise the young potential authors to improve their skill of writing so that the acceptance rate of publication is improved without significant comments and efforts of the editors of the journal. The article is based on the available literature combined with the experience of the author himself as reviewer and editor of biomedical journals. The treatment patterns of clinicians are moving towards evidence-based medical practice. Hence, a clinically relevant research question based on the contemporary knowledge gap is studied using appropriate research methodology. The writers are informed about the criteria to be fulfilled to claim authorship. Finally, emphasis is laid on the essentials of good medical writing necessary for publication. The writing for submission to biomedical journal is both an art and science in itself. A scientifically well-conducted study along with a sound knowledge of the mechanics of writing will enable the novices to achieve better acceptance rate for publication.

Key words: Biomedical, journals, research, submission

INTRODUCTION

The importance of moving away from empirically decided treatments to evidence-based medical practice rests on whether or not a clinician feels research as relevant to base his decisions on available scientific evidence. Similarly, conducting research and publishing the same not only establishes a connect with fellow researchers, but also has become an essential requirement for a variety of reasons, including career advancement.

David Sackett, of McMaster University, Canada considered to be the father of ‘Evidence-based medicine’ highlights the importance of research strategy and research question to communicate the outcome of our studies to fellow practitioners. Haynes suggests that before a research question is developed and research is conducted, it is essential to know ‘where the boundary between current knowledge and ignorance lies’. Then on, the researcher may face many other barriers while conducting a study such as choosing the appropriate study design, ensuring good quality data collection, data storage and entry and appropriate statistical analyses. However, after overcoming such barriers, he is faced with another daunting challenge, that is, to write the research work for publication.

The Medical Council of India (MCI), the regulator of Medical Education in India, mandates to provide training in research during post-graduation studies. Accordingly, a thesis or dissertation is expected to inculcate an aptitude for research methodology and critical analysis among the post-graduate residents. Furthermore, MCI makes it mandatory for its entire medical teaching faculty to be involved in research and publication with an ultimate aim of...
benefiting both the full-time researchers and medical practitioners.\(^3\)

An author must learn to take care of the sentence construction, correlation and readability without straying from the objective. He should keep in mind the target readers, as the language and format totally depend on the target journal. With the strong base of sound scientific knowledge, and using the power of communication, one can certainly be a best medical author with a quality difference.

The views presented in this submission are based on the experience of the present author as reviewer and editor of journals. The aim is to provide an advisory to potential authors on how to increase the chances of their manuscript being accepted for publication.

To write an original article successfully, there are three essential requirements, the ‘basic triad’ of an original article which includes, a subject worth reporting, knowledge of the basic structure of a peer-reviewed article and knowledge of the essentials of good writing.\(^4\)

**The essentials of good writing**

The article must engage the reader’s interest and communicate results succinctly. In general, all the professionals are busy; hence, any clinician or researcher may only look at your work briefly, if at all. Kotz suggests that the art of scientific writing can be acquired by following certain basic rules for writing a manuscript.\(^5\) Any well designed and conducted scientific research is easier to write if efficient writing methodology is followed.

**Authorship**

To qualify as an author, the person must have contributed something worthwhile, such as creative thinking, performing diagnostic or therapeutic techniques essential to the study, collecting data, or writing the paper.

The recommendations of international committee of medical journal editors (ICMJE), also referred to as Vancouver protocol states that, to be credited as an author, each and every author in a publication must have been involved in the following.\(^6\)

1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; and
2. Drafting the work or revising it critically for important intellectual content; and
3. Final approval of the version to be published; and
4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

A medical writer can only be a facilitator in developing the manuscript, but the named author(s) must take responsibility for the content. A legitimate author needs to be involved in all the four above, to be acknowledged as an author. Solely acquiring funding or collecting data does not justify authorship. All professional medical writers should not be listed as the author of publications if they do not fulfil the above authorship criteria. However, a professional medical writer is legally entitled to assist any named author in preparing a manuscript for a peer-reviewed biomedical journal or material for clinical presentation. However, the term ‘Ghostwriter’ is used to describe professional medical writers, when there is something secretive about the involvement of such writer.\(^7\)

**Why authorship is important**

Sometimes, publications are essential requirements to get a job or career advancement. However, the authorship is about having both credit and responsibility. The academic life revolves around publication, and the credit comes from publishing, which implies being an author. Rarely, one may have a component named after him/her, for example, Mallampatti classification, or Ramsay’s sedation scoring. Authorship also means that you are accountable. Who is the author of a fraudulent paper? Authors can be sued for libel. Many authors of papers may have done little and hence do not meet ICMJE criteria but still may be gifted with what is described as ‘Gift authorship’.

**Conflict of interest**

A person is said to be having a conflict of interest when he or she has an attribute that is invisible to the reader or editor but which may affect his or her judgement. It is relevant because of the perception that a person’s judgement may be affected whether it happens or not. At the same time, it is a sensitive issue which cannot be ignored lightly and hence a disclosure to the editor, author and reader is always essential.

An original article for submission must be in two parts. A title page and abstract written under the headings of title, abstract, key words, acknowledgements
and references often referred to as TAKAR. The main article must be written under the headings of introduction, materials and methods, results and discussion (IMRaD). They must be submitted along with summary or conclusion and references in required style. The Tables, Figures, acknowledgements and declaration of Conflict of Interest should be submitted separately.

Title, abstract, key words, acknowledgements and reference (TAKAR)

Title
The title of the articles should describe the contents of the article, and must contain key words so that electronic database can search the article. If necessary, title may provide the key results of the study. A poor title can be, for example, ‘fentanyl adjuvant for prolonged analgesia’, which can be rewritten as ‘intrathecal fentanyl added to local anaesthetic to prolong post-operative analgesia’.

Abstract
The first sentence of the abstract should clearly state the objective of the experiment. The abstract should not include undefined abbreviations or references to papers in the main text. All conclusions in the abstract should be supported by the results of present the study only and it should focus on the objectives of the study. The abstract must contain major aspects of the study in one paragraph in 150–250 words.

It is advisable to choose the title and write the abstract after the final draft, in consultation with other co-authors.

Key words
Always list about 3–10 key words which are listed as Medical Subject Headings (MeSH) in Index Medicus.

Acknowledgement
The authors would like to acknowledge the help received for any aspect of the study but not amounting the authorship. It also includes the acknowledging of funding agency.

References
It is necessary to use the reference format that is mandated by the journal. Most of the biomedical journals use the Vancouver style of references, where references are arranged numerically in reference section according to the order of appearance in the text, and expressed in the text at relevant sentences as superscripted numbers or written in parenthesis. The Harvard style is often used in thesis writing, and references in the text are written as name of the authors and the year of publication, and arranged alphabetically in the reference section.

Introduction, materials and methods, results and discussion (IMRaD)

Introduction
The proposed research must support both the clinical and academic interests and hence must be decided after a thorough study of available knowledge. There must be a strong rationale for the purpose of the research. Since research is a time consuming and expensive endeavour, building on best available knowledge is favourable rather than trying to reinvent the wheel. The introduction should always be constructed as a descriptive funnel, starting with broad topics and slowly focusing on the work at hand.

The introduction section should include a brief review of the subject of the study, and must highlight the research question in the context of existing gaps in the knowledge and our current understanding of the problem. It should also mention how this study will advance our knowledge. It is better to focus our attention on 4–5 pertinent original research articles and review articles rather than reference books because research articles summarise all the research done on a particular subject area over a recent period. Techniques or protocols should not be discussed during the introduction. But if it is a novel technique or a method never used before, it can be presented in the introduction.

Materials and Methods
The purpose of describing the methods is to enable another researcher to reproduce the study and compare the results in a similar setting. It should include a minimum of five basic components.

1. The study population must be described, the number of patients recruited for study, age group, gender, weight, etc.
2. In the methods used in the study, the details of interventions, drugs and dosages, route, timing and frequency of administration, etc. should be always provided. It is necessary to describe the details of manufacturers, city, country and year of manufacturing of new or specialised equipment or drugs, especially when they are newly introduced. Only the subjective parameters such as sedation scores and discharge criteria, if used, may be described in detail.
3. A clear design of the study, the type of study, for example, randomised controlled clinical trial (RCT), prospective or retrospective study, inclusion-exclusion criteria, blinding/masking must be described. A detailed description of the power of study, estimation of sample size and its rationale and duration of study are beneficial in validating the results. Randomisation generates a very high level of evidence in prospective RCTs. The study parameters must always be clearly defined how and when they were measured and how long they were measured. Authors must describe outcomes of the study, both continuous and categorical variables.

It is advisable to mention the setting in which study was carried out so that other researchers can verify them in their setup.

4. The statistical methods used must be described and also the details of software, version and year of release may be described. For uncommon statistical methods, reference may be cited. The Statistical tests used for data analysis including the probability level at which level the significance is determined must be described.

5. Ethical considerations: Authors must always describe approval by Institutional Ethical committee/Institutional Review Board, and finally conflict of interest statement and Source of funding if any, are desirable. A compliance of the Helsinki Declaration for animal studies (if applicable) is essential.

The use of the passive voice is probably most appropriate while describing the methods section. The identity of the patients should not be disclosed at any level. Avoid using ambiguous terms and other subjective parameters in the study as far as possible.

**Results**

Galileo said ‘measure what is measurable and make measurable what is not so’. Hence, use specific statistical tools to obtain straightforward answers. All study population must be accounted in the results, and the complete details must be presented unequivocally, unambiguously and in logical order, but without any interpretations. It is worthwhile to note that the outcome of statistical analysis is not a key result but rather an analytical tool that helps us to understand the results. All relevant key statistics such as the samples size, the index of dispersion (standard deviation, standard error of the mean), and the index of central tendency such as mean, median or mode, including P values must be stated under results.

Only the primary outcome measures relevant to the aim of the study to be analysed with appropriate statistical tools to obtain an objective proof or otherwise of the aim of the study. Remember that the studies are normally not designed to evaluate secondary outcome measures, but still, they may be generated from a posthoc analysis.

The data can be presented either as text, tables or graphs to reduce the amount of text and should be complementary to the text, not repetitive. The use of pie charts or bar diagrams is not preferred in journals. The table legends must be described on the top of the table and figure legends at the bottom of the figures. The statistical test summaries are reported in parenthesis along with clinical results, for example, ‘The results of post-operative analgesia in Group B (178.5 ± 21 min, n = 60) is shorter than the Group BF (347 ± 74.5 min, n = 60) in the elective C-section patients studied…’.

Always use the appropriate units of measurements, and abbreviations should be used with only data and not in the text description, except the approved abbreviations, for example, °C or °F. These units should be placed after the error value, for example, 110 ± 9.8 mm Hg (not 110 ± 9.8 mm Hg). When a series of numbers are used, then unit should be placed after the last number 2, 4, 6, 8 and 10 min, and not as 2 min, 4 min, 6 min, 8 min and 10 min.

**Discussion**

Here, the observed data are interpreted in the light of already known information in a text format. Absolute numbers and percentages should not be used unless felt really beneficial.

The discussion paragraph must focus on whether author’s findings agree with other publications. If not, any definite reasons can be offered, such as different clinical scenario or design flaws, etc. It should be clearly stated whether the results provide an answer to the research question? The conclusion of the study must describe the new understanding of the problem and inform whether it is necessary to conduct further studies to get additional information. Finally, the limitations of the study if any, and the suggested ways and means to overcome them should be described.
It is important to note that any new results should not be introduced here if they are not presented earlier in the materials and methods, and results. In addition, the results and recommendations so made should not go beyond the limits of the study and clarify whether they can be extrapolated to similar circumstances or not.

**Summary**

The author should summarise the results in the face of aims of the study and provide a take home message in 'authors own language', without adding any new information or conclusions here. Care must be exercised to ensure that this paragraph is not a repetition of abstract.

**The mechanics of writing**

- Before writing to a particular journal, please read the set of instructions to authors published by the editorial board. Follow the particular set pattern with regard to format, style and content meticulously
- The writing must always have precision, clarity and economy of words
- It must be presumed that an ordinary reader has at least the same level of knowledge and expertise base as you have
- Prose: Always write complete sentences and easily understandable language using correct grammar and spellings. Write clearly and concisely so that every paragraph conveys a particular message and meaning. A poetic language and flowery prose will not impress the readers. Reviewers always look for the clarity, brevity and validity of sentences
- Appropriate and consistent use of precise word conveys lot of messages with few words, but never uses words, which many people have never heard of. Avoid using colloquial or slang language
- The abbreviation should not be used when writing a text, except for probably temperature, for example, 57°C or 98.4°F. Always use terms 90 mm, 40 min, 18 years during the text format
- Use of active words improves clarity, and the message is sent effectively. For example, oxygen requirement by the myocardium is increased, or Myocardial oxygen demand is increased.

Plagiarism is, unfortunately, a major evil haunting the publication world. If any submission is based on prior work, be sure to reference that prior work properly, because an original research paper should not contain previously published data in any form without a proper citation. Furthermore, duplication or salami publication must be avoided.

**SUMMARY**

Meticulous planning and conduct of the study is not the end in itself. It also requires appropriate reporting of the research work in a scientific format for the benefit of colleagues and the society. The established guidelines of the journal must be adhered to and the ingredients of the manuscript should be cautiously prepared without any ambiguity or confusion for the readers.

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**Conflicts of interest**

There are no conflicts of interest.

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