Review Article

Writing for publication in a medical journal

R. Grant Steen

Medical Communications Consultants, LLC, 103 Van Doren Place, Chapel Hill, NC, USA

ABSTRACT

The essence of writing for publication in the medical field is distilled into a dozen precepts to guide the anxious author. These precepts focus on the attitude of the writer, rather than the mechanics of writing. A medical author must strive to be the following: Original, honest, innovative, organized, careful, clear, modest, fair-minded, frank, persistent, rigorous, and realistic. These attributes are essential because there is a new climate of skepticism among the lay public as to the validity of scientific and medical claims. This climate has encouraged journal editors to be demanding of authors and to be especially vigilant about plagiarism; originality of all contributions is therefore essential.

Key words: Medical writing, medical ethics, publication, plagiarism,

Introduction

There is always a danger in writing about writing. The effort can look presumptuous, in that few writers are truly in a position to tender advice; more medical writers are workmanlike than inspired. Writing a paper about writing a paper can also seem futile because guidelines have to be so broad as to be vague. Practical advice about writing a research report is necessarily different from advice about writing a systematic review or a case report.

Still, there can be no doubt that scientists writing their first paper need guidance, and such guidance can be hard to find. With full awareness that this effort may seem both presumptuous and futile, the lessons of a career in writing are distilled into a few precepts to guide the anxious author. These precepts focus on the attitude of the writer, and leave practical advice as to the mechanics of writing to other authors.[1]

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Be Original

Lack of originality is the cardinal sin in a creative field. Using the words or thoughts of someone else without adequately crediting that person is plagiarism.[2] Lack of originality can include plagiarism of words, of ideas, or of one's own already published work. Plagiarism can have serious consequences, including retraction of papers, suspension or firing of authors, and other legal actions.[2] In fact, up to 29% of all papers retracted were faulted for some form of plagiarism,[3] and authors in India have been responsible for about 6% of retractions worldwide.[4] Some believe that India cannot emerge as a global player in science and medicine until plagiarism is reduced, so a "National Plan of Action" has been proposed.[5]

A distinction has been made between theft of words and theft of data.[3] Theft of words is clearly plagiarism, but theft of data is a more serious crime that has been called data fabrication. Theft of words can happen inadvertently, whereas theft of data is always a calculated act. As scientists, our first duty is to defend the authenticity of data; the originality of words is more a concern of writers and publishers, which many scientists do not aspire to be. Though this viewpoint is controversial, plagiarism of words could be considered error, whereas plagiarism of data must be considered fraud.[3]

Corresponding Author: Dr. R. Grant Steen, Medical Communications Consultants, LLC, 103 Van Doren Place, Chapel Hill, NC 27517, USA.
E-mail: G_Steen_MediCC@yahoo.com

The essence of plagiarism is that the writer claims something as his own when it is not his to claim.[6] Failing to give credit where credit is due amounts to theft from the owner of that material. Such theft may not be a material loss to the owner since in academic circles, no exchange of money is usually involved. Yet, it is certainly a material gain to the person who appropriates such material, making the plagiarist seem more creative or more diligent or more intelligent than is warranted.[6]

Plagiarism can be hard to avoid, especially when writing in English for the first time.[7] Authors often have difficulty expressing their ideas or using the idiom of science. Some authors believe it is a form of flattery to use the words of a mentor, or that there is little harm in borrowing phrases that may describe findings better than more original words. Yet, the attitude in science is that recycling of words without attribution is a crime.[7] Interestingly, when plagiarism-detection software was used to assess all submissions to a single journal, 11% of manuscripts were found to have some degree of plagiarism, with the average extent of theft in plagiarized manuscripts amounting to about 25% of the text.[8] Generally, the extent of plagiarism was highest in the Materials and Methods section,[8] confirming that plagiarism is most likely in describing experimental methods.

Self-plagiarism, the act of extensively borrowing words from one's own published work, is strongly discouraged.[9] Some people dismiss this practice by saying that it is impossible to steal anything from oneself, and that self-plagiarism is no worse than laziness. But the net result of repeated self-plagiarism is that the productivity of a researcher is artificially elevated. Thus, a degree of deception is involved in self-plagiarism.[9] Because professional advancement and scientific reputation depend upon research productivity, self-plagiarism is a form of theft from the scientific establishment. As a practical matter, some journals use a guideline that up to 30% of the words in a paper can be recycled by an author from a previous paper, but no data, whatsoever, can be recycled.[10]

Be Honest

Writers must be scrupulously, unrelentingly, and totally honest in their work because any dishonesty will eventually be discovered and fabricated or falsified data is judged harshly.[3-4,11-13]

Science is generally thought to be self-correcting; scientists are eager to criticize new work and to fault established wisdom. For example, there has been an ongoing debate as to whether the results presented a century ago by Gregor Mendel, the father of modern genetics, are too good to be true.[14] Mendel bred pea plants together in various combinations to understand how individual plant traits are expressed through the generations. His work was eventually accepted as the first physical evidence of genes. However, R. A. Fischer, the father of modern statistics, did a detailed statistical analysis and concluded that Mendel's data were too close to the ideal expected if experiments had involved a larger sample size. This suggests that Mendel may have "edited" his data after collecting it,[14] a transgression that would now be called data falsification.[3] The point is not that Mendel was dishonest; we cannot know this with certainty. Yet, we do know that his results are still being examined and questioned more than a century after the fact.

Be Innovative

Attacking the same problems with the same tools will often yield the same results; it can be useful to approach an old problem in a new way. For example, personalized medicine has caused a paradigm shift in oncology; the idea that each patient should be treated in a way individually tailored to the genes unique to their tumor has caused a great deal of excitement. Yet, it is only recently that the idea of personalized medicine has come to diabetology.

For many years, the goal of treatment of type II diabetes mellitus (T2DM) has been to lower glycemic levels as close to normal as is safely possible.[15] Tight glycemic control is known to reduce complications of the disease that affect the eye, kidney, and nerve. Although T2DM is heterogeneous – in terms of presentation and pathogenesis – patients tend to be treated in similar ways. Hence, it cannot be surprising that current T2DM therapies often fail to achieve glycemic control, particularly over the long term. Somewhat more than half of all diabetics achieve the goal of glycosylated hemoglobin (HbA1c) <7%, so patients are at risk of eventual diabetic complications.[15] Insight into the genetic variability that probably underlies the heterogeneity in clinical presentation is an innovative clinical strategy. Identification of the Kir6.2 mutations as potentially responsible for several forms of maturity-onset diabetes, as well as a better understanding of the polygenic nature of T2DM, suggests that personalized medicine may enable better glycemic control in patients.[15]

Be Organized

There is a specific structure to a science paper, as formal and as circumscribed as haiku poetry (see http://www.ijem.in/contributors.asp). If writers do not use that structure, they are unlikely to get published. This may seem a trivial point in that a good idea badly argued is more easily fixed than a bad idea well argued. But people are busy; if an author does not organize his writing, why would anyone read it?

The key thing in writing science papers is to first finalize the data. All tables and figures should be put in final form before anything else is attempted. Then throw out your preconceptions and look at the data with a fresh eye; what story do the data tell? Jot down conclusions looking at the data as a new reader would, without thinking about what you were trying to prove. Sometimes the story that emerges is not the story you intended to tell, but as long as the story is driven by data, the story is worth telling in a paper.

Be Careful

It is often little details that trip up big ideas. Recently, Einstein's theory of relativity seemed at risk, because European physicists had detected subatomic particles known as neutrinos that seemed to be moving faster than the speed of light.[16] Yet, newer evidence suggests that the excess speed of neutrinos may really have been excess zeal of the neutrino-detecting scientists.[17] When the apparatus used to make the measurement was carefully examined, a loose wire was found that made neutrinos appear to move faster than they were actually going.[17]

A misplaced decimal point, a cut-and-paste error in a table, a crucial typo, a tiny miscalculation – each of these minor errors has sunk many papers. Check every number two or three times, then put the paper aside, come back to it with fresh eyes, and check it again. The accuracy of the data is the first concern; you cannot have good science without reliable numbers.

Be Clear

The ideas in science are so complex that the words used to describe those ideas should be simple. Verbal excess and flowery language must be avoided; prose should be clear and direct. Acronyms never add clarity, though they can sometimes help with economy of words; nevertheless, acronyms do more harm than good.

Clarity is especially important in the Results section, the beating heart of a paper.[1] Writers should lead readers through the results with clear, direct sentences. Writing should convey competence and professional authority and that is often accomplished by writing in first person and using the active voice. Active voice emphasizes the agent of an action; passive voice emphasizes the result of an action. "We analyzed the results" is clearer than "The results were analyzed," because the latter formulation leaves open the question of who performed the action.

In a paper, as in a mathematical formula, less is more. Clarity can only be achieved by direct thinking, which is associated with direct writing. Precision of thought is important, and concision of words is a useful marker for it. It is easier to generate confusion with many words than with few. If concision reveals a paucity of ideas, then do not write more; think more. The most important biology paper of the last century was extremely short – Watson and Crick's description of the structure of DNA in *Nature*[18] was scarcely a page long – yet, it revolutionized biology.

Be Modest

It is a major mistake to claim too much credit, whether for the strength of your data or for the originality of your ideas. Science is an iterative process by which we approach the truth in tiny steps. None of us would be where we are without people before us who blazed a trail; none of us could have followed that trail without mentors and colleagues. Modesty is not merely appealing; it is essential.

A model of scientific modesty is provided by the penultimate paragraph of Watson and Crick's famous paper on DNA:[18] "It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material."

Be Fair-Minded

Do not misrepresent an argument merely to demolish it as this is intellectually dishonest.[19] You cannot be certain you are right, so you cannot know that others are wrong. In science, we struggle to illuminate the darkness of ignorance and darkness always resists light.

One way to be sure you are fair-minded is to circulate your manuscript among colleagues. This is particularly valuable if you have a colleague with whom you have disagreed. A disagreement about a paper prior to submission can result in a stronger paper; a disagreement about a paper after publication can harm a career. You should also offer to review your colleague's papers prior to submission.

Be Frank

Flaws and weaknesses are present in every paper; be open about the blemishes in your paper. This does not diminish your work; it builds credibility for you as an investigator and opens a door for others to follow you. For example, India was estimated to have 51 million people with diabetes.[20] But this estimate was based on small, often under-powered studies done in various parts of the country, and methods were heterogeneous between studies. Component studies were weakened by differing diagnostic criteria, unconfirmed preliminary diagnoses, local, regional, and ethnic differences, poor characterization of measurement error, and spotty coverage in rural areas.[20] It may seem an error to confess such weaknesses openly in the literature, but it creates a spectacular research opportunity. Because these various weaknesses were known, a national study on the prevalence of diabetes in India was proposed.[20] When the national study was done, it was found that there are actually about 62 million people with diabetes in India,[21] 11 million more than had been predicted.[20]

Be Persistent

Your work may not be recognized as worthy of publication the first time it is submitted to a journal. This is the normal course of events; most journals will not accept a paper on first submission even from a prominent author, so the novice writer should not be discouraged.

Your paper may require a rewrite; after all, which paper cannot be improved? But it may also be true that the journal was not a good fit for your paper. The best course of action is to put the review of your manuscript in a drawer and leave it there until the sting of rebuke wears off. Then, being as dispassionate as possible, go through your manuscript with the comments in hand and see which of those comments are helpful.

If the referees enable you to see something which you did not see before, or if the referees have made an error that you can persuasively counter, then it may be possible to resubmit your manuscript to the original journal. If you cannot respond to all of the comments by either altering your manuscript or rebutting the criticism, then it may be time to pick another journal for submission. Often a clue as to which journal provides the best fit for your paper is to look at the references cited. There can be an alignment between what a journal has published in the past and what that journal is likely to publish in the future.

Many papers go through an odyssey of submission and rejection before they finally achieve publication and some papers are finally published in a journal more prestigious than the original journal of submission. Writing and submitting papers requires a thick skin and a resilient nature.

Be Rigorous

You can never "prove" a hypothesis; you can only fail to disprove it.[22] Of 276 studies published in Indian journals in 2009, roughly 5% claimed that an insignificant P value proved the null hypothesis. This is incorrect; if a study is inadequately powered, it likely will fail to identify a difference between treatment groups.[22]

Careful analysis of the medical literature has revealed that statistics are misused in a great many papers and in a variety of creative ways.[23] Many statistical errors have been identified, which break down into five broad categories: Flaws in study design, in data analysis, in documentation of statistical methods used, in presentation of data, and in interpretation of findings.[23] Statistical software is widely available, yet such software requires knowledge of the assumptions inherent to the statistical tests and of their limitations. Statistical errors in published papers are so common that a statistician should be involved at study inception, to minimize damaging errors.

Be Realistic

If something is statistically significant, that does not mean that it is clinically significant, and clinical significance is far more important.[24] A study that enrolls a great many people and finds a tiny difference upon treatment may achieve statistical significance and still mean nothing for a patient. Reality is strained when clinical trials use composite endpoints that make the trial more likely to obtain a positive result because such endpoints also make it harder to determine if a new patient will benefit from treatment.[24] For example, the JUPITER trial[25] enrolled 17,802 apparently healthy men and women and treated them with rosuvastatin for 1.9 years. The primary outcome measure was, "the occurrence of a first major cardiovascular event, defined as nonfatal myocardial infarction, nonfatal stroke, hospitalization for unstable angina, an arterial revascularization procedure, or confirmed death from cardiovascular causes."

This composite endpoint conflates medical events that vary greatly in severity.[26] A nonfatal stroke may not impinge much on the patient, whereas death is hard to ignore. This compound endpoint may have falsely inflated the odds that medication would be deemed helpful. The JUPITER trial may have been unrealistic in other ways as well. Cardiovascular mortality was surprisingly low, since healthy people were enrolled and the trial was prematurely terminated. Because few primary endpoints were observed, results are more prone to statistical fluke than if there had been many cardiovascular deaths over a long follow-up period. Thus, JUPITER may not present a realistic picture of the potential benefits of statins in healthy people.[26]

Conclusion

I cannot promise that if all these precepts are followed, publication will follow; talent, energy, and luck are also required. I cannot promise that publication will get easier over time; each new paper presents unique difficulties. I cannot promise that every paper will garner praise and honors, once it is written up; writing is just the last step in research and strong writing cannot compensate for a weak experiment. But I can promise that seeing the first publication – or even the hundredth publication – will be a thrill.

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