Tips on how to write a paper

Timothy M. Johnson, MD
Ann Arbor, Michigan

Academics involve the search, education, and communication of knowledge. The credibility, advancement, and prestige of any specialty, program, or person involved in academics is enhanced by the quality of papers published. This occurs in the form of peer-reviewed research, along with observations and wisdom from institutional and private practice. Learning and mentoring medical manuscript writing skills is a process that improves with training and doing. The purpose of this manuscript is to serve as a guide with tips to aide the process of better writing, which may be particularly helpful to those in search of writing skills mentorship. (J Am Acad Dermatol 2008;59:1064-9.)

There are many reasons to write a paper. Writing stimulates the brain. Evidence supports the association of cognitive activity in all stages of life with a significant reduction in onset of dementia.[1,2] Good writing cultivates clear thinking, discipline, analytical ability, and a sense of accomplishment.

Reporting new or interesting observations and rigorous research advances knowledge and improves disease management. Writing is a teaching tool that results in learning with author command of a subject. Sometimes the educational gain may be even greater for the author than the reader. Scholarly publications are a major determinant in promotion, career development, and reputation for faculty at academic institutions and may facilitate funding opportunities. And finally, writing can be fun! The best papers are written for several of these reasons with duty and passion at heart.

THE EVIDENCE PYRAMID

All evidence is not created equally. The evidence pyramid serves as a guide to find the most reliable information and determines rigor of results. The hierarchy of levels of evidence ranges from highest to lowest as: systematic reviews and meta-analyses (of highest level evidence) followed by randomized controlled trials, cohort studies, case-control studies, case series, case reports, ideas/editorials/expert opinions, animal research, and, finally, test tubes.

The Cochrane Collaboration is a good resource for high-quality systematic reviews.[3,4] This international organization prepares, maintains, and updates evidence-based reviews on thousands of medical topics and interventions. The reviews are published in the Cochrane Library and Cochrane Database of Systematic Reviews, and are available in paper, CD-ROM, or Internet format.[4] They are regarded as the gold standard for systematic review articles.[3]

Although meta-analysis of studies with highest levels of evidence is at the top of the evidence pyramid, pitfalls exist. The most common is inclusion of low evidence studies, which dilutes the overall rigor and reliability. Positive studies, especially small series and case reports, are published more often than negative studies. This creates positive publication bias in the literature with potential for evidence distortion. In this scenario, inclusion of all small reports, even numerous weak positive studies, may add up to an overall strong positive conclusion in a meta-analysis.

An understanding of the hierarchy of levels of evidence is necessary to research a topic and clarify the best from the worst for referencing, learning, and designing a study. An understanding of where the article falls in the evidence pyramid helps decide what type of journal and to which journal to submit. The magnitude of scientific evidence from biomedical research continues to rapidly increase. The amount of literature pertaining to clinical questions with highest level evidence at the top of the pyramid, however, is still much less than at the bottom. Several excellent articles relevant to explaining levels of evidence, evidence-based medicine, and study design are beyond the scope herein, but referenced and well worth reading.[3-16]

From the Departments of Dermatology, Otolaryngology, and Surgery, University of Michigan Medical School.
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Correspondence to: Timothy M. Johnson, MD, University of Michigan Health System, 1910 Taubman Center, 1500 E Medical Center Dr, Ann Arbor, MI 48109-0314. E-mail: timjohn@med.umich.edu.
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GET STARTED

There is no single best way to write or get started. It varies from paper to paper and person to person. Background reading with a thorough literature search is essential to determine what has been published and to what level. Identify solid mentors with time and commitment to help, ask for their help, listen, and learn. Select a target journal and review the author guidelines. Establish a realistic timetable and outline to complete the work, and then adhere to the schedule. The best writing requires private stretches of protected hours, days, or weeks. Determine the best individual time to write based on a personal biorhythm/biological cycle and sustain momentum. Writing success is appraised by what is finished, not by what is attempted.

PARTS OF A MANUSCRIPT—STRUCTURE

Many novice writers begin by writing out of order. The proper order of writing greatly facilitates the ease of writing. The sequence of writing sections should occur in the order from first to last as: Methods, Results, Discussion, and Introduction. These 4 sections represent the core of the paper.

Methods—what did you do?

Methods are written in past tense in adequate detail to repeat the study design and validate results. An explicit study design with sections such as statistical methods, inclusion and exclusion criteria, and retrospective or prospective viewpoint should be described. When applicable, it is important to enlist the help of a statistician at the onset to determine sample size, power analysis, and appropriate statistical methods.

Research is defined as "any investigation designed to develop or contribute to generalizable knowledge."[17] A human subject is defined as "an individual about whom an investigator obtains data through intervention or interaction with an individual or identifiable private information."[17] Most research involving human subjects requires formal institutional review board (IRB) or similar ethics board approval. However, some studies are exempt from formal IRB review; but determination of exempt status is made by the IRB, not by the investigator before performing the study or writing the paper. The most common exemption scenario involves a retrospective chart review categorized by the US Department of Health and Human Services as: "Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects."[18] A case report involving 3 or fewer cases also may not require formal IRB review. The IRB can assess and will create a form letter to document their assessment that formal IRB review is not required if applicable. A statement of IRB status should be made usually at the beginning of the "Methods" section. Of note, studies involving vertebrate animals must be approved by a review committee on use and care of animals, which is different from the IRB, before experimentation begins.

A physician not affiliated with a university in private practice conducting human subject research must obtain IRB approval if the research involves a Food and Drug Administration—regulated product or federal funding. Research in collaboration with a hospital usually requires IRB approval. Exempt research strictly within a private practice probably does not require IRB endorsement unless the practitioner intends to publish the paper in a peer-reviewed journal. Physicians in private practice can call the nearest university IRB for help, or use a private IRB service. To learn about IRB rules and regulations if unfamiliar, start by reading a local IRB World Wide Web site and identify mentors who understand the process.[19]

Faculty in academic institutions are usually also required to complete a World Wide Web site—based course such as the Program for Education and Evaluation in Responsible Research and Scholarship (PEERRS) certification before IRB approval. PEERRS certification fulfills the federal requirement for human subjects training for principal investigators and key personnel. The International Committee of Medical Journal Editors also mandates clinical trial registration onClinicalTrials.gov or similar format for publication of such studies.[20-22]

Results—what did you find?

Results should also be written in past tense, just the facts in a logical sequence. The importance of accuracy cannot be overstated. Check and recheck data and numbers and be certain they add up correctly. Provide numbers and percentages, *P* values, and confidence intervals. Avoid any discussion of the implications of the results in this section. Tables and figures should be straightforward, concise, and not duplicative with text. Tables should include a short specific title with footnotes where necessary. Figures must be concise with clear short legends to the point. Quality of figures is vital and distracters such as glasses and blood should be

avoided. Patient anonymity is required unless consent for publication is obtained.

Discussion—what does it mean?

Outline two to 5 main points that emerge from the results. Build one to two paragraphs for each point with a focus on the most interesting results obtained from the study. The author is permitted some liberty to elaborate and speculate in this section. First address the main question, hypothesis, or purpose of the study. Discuss and compare the results to previous publications and viewpoints. Explain what is new with perspective without overstating. What do your results mean in terms of clinical practice, management, or guidelines? If applicable, discuss strengths and weaknesses in relation to other studies, particularly any differences in results. Usually avoid ending with a conclusion or summary section if redundant. The phrase "further studies are required" should only be used if necessary and may imply the need to do such studies before submitting.[23]

Introduction—what is the question/objective?

The introduction section should be short, approximately 3 paragraphs in one page. Writing the introduction last prevents writer's block and is easier after the first 3 sections are completed. The first paragraph should provide a brief background in present tense to establish context, relevance, or nature of the problem, question, or purpose (what is known). The second paragraph may include the importance of the problem and unclear issues (what is unknown). The last paragraph should state the rationale, hypothesis, main objective, or purpose (why the study was done). Data or conclusions from the study do not belong in this section.

Abstract, title, references

These sections should be written last. The abstract content and quality often determine whether a manuscript gets read. It should be succinct, structured per specific journal format within the word limit, and without acronyms and abbreviations. References should be double-checked for accuracy. The author should be selective to cite only references that are essential, relevant, or seminal. Balance of opinion difference and strength of evidence is a necessity. Read the references, use correct style for the journal, and correctly quote other's data with no manipulation. The title determines how a manuscript gets indexed and thus should succinctly describe and identify the core of the paper.

FIRST DRAFT

Initially, the first draft may be written quickly without great attention to detail to get thoughts on paper. The manuscript parts initially should be written by a single author, not split between coauthors. Disregard spelling, grammar, style, and troublesome words and phrases. Correct and rewrite after the core text is finished in first-draft form.

STYLE—ACCURACY, CLARITY, BREVITY

"Proper words in proper places make the true definition of style." —Jonathan Swift[24]

"Vigorous writing is concise. A sentence should contain no unnecessary words, a paragraph no unnecessary sentences. . ." —William Strunk, Jr[24]

"The best writing has no lace on its sleeves." —Walt Whitman[24]

"The best writers make the fewest words go the longest way." —Anonymous[24]

Pay close attention to grammar and style.[25-28] Readers and reviewers will get the authors' points if the writing style is clear and precise. Use concrete over vague language, and double-check data, spelling, and grammar. Active voice is more concise and crisp. In active voice the subject is performing the verb. In passive voice the subject receives the action expressed in the verb. "The dog bit the cat" is active voice. "The cat was bitten by the dog" is passive voice. When the majority of text is written in passive voice, the manuscript is wordier and dull to read. Avoid overusing phrases such as "there is," "there are," "that were," "it is," and "it was." For example:

- There are treatment guidelines for Merkel cell carcinoma that were reported by Bichakjian.
- *Correction:* Treatment guidelines for Merkel cell carcinoma were reported by Bichakjian. (Passive voice.)
- *Better:* Bichakjian reported treatment guidelines for Merkel cell carcinoma. (Active voice.)

Almost all first drafts have too many words. Vigorously trim every sentence with subsequent drafts by deleting repetition, wordiness, long sentences, and excessive adverbs and adjectives. Economy of style with clarity and brevity improves with the deletion of unnecessary words. A few examples include: "a majority of" = "most"; "is defined as" = "is"; "referred to as" = "called"; "at the present time" = "now"; "has the capacity to" = "can"; "a considerable amount of" = "much"; and "it is clear that" = "clearly."

Many abbreviations and acronyms create difficult reading but may be useful for a word occurring numerous times. Avoid using colloquial words and

troublesome terms such as "and/or"; "and" or "or" alone usually suffices. Using a disease as a noun such as "diabetic" may be condescending to some; "patient with diabetes" may be better. "Significant" means statistically significant. Finally, use of "first" (first to report. . .) is rarely important or additive to a paper. If "first" is used, details should be provided if positively true.[29,30]

AUTHORSHIP

The International Committee of Medical Journal Editors list uniform requirements for manuscripts submitted to biomedical journals.[31] The first author is primarily responsible for collecting and analyzing data, and writing the manuscript. The last or senior author is usually an established investigator, a primary mentor, and assumes overall responsibility. The middle authors are usually listed in order of contribution.

Get coauthor and mentor help before, during, and after the draft documents and ask them to assess critically. "I don't understand or follow the point here" is more important than "'oncololy' is misspelled." Learn with an open mind from editing changes and suggestions. All authors should participate.

REWRITE

"Good writing is rewriting." —Truman Capote[24]

Becoming an excellent rewriter is fundamental to being a good writer. Envision your paper through the eyes of an independent peer reviewer who will be reading it for the first time. Hone and double-check grammar, style, spelling, and references. Shorten and thin the paper at every chance for crispness, with a focus on accuracy, clarity, and brevity.

ETHICS

Ethical breaches of publication and scientific integrity exist including: data manipulation and falsification, duplicate manuscripts, redundant publication, plagiarism (print and electronic), human or animal use concerns, and author conflicts of interest with failure to disclose.[32,33] Self-plagiarism occurs when authors recycle their own previous work without full disclosure to the original publication.[34,35] This occurs in the form of redundant and dual publication, copyright violation, and "salami publishing." Redundant publication with use of the same hypothesis, data, or discussion points submitted to different journals or textbooks, or expansion of a previously published data set without full justification, cross-reference, and disclosure is prohibited. A previous meeting abstract publication does not preclude subsequent publication, but disclosure is required. Dual publication exists when different authors, sometimes with overlap, submit similar or identical content. Salami publishing occurs when one large study that should be published in its entirety is sliced into smaller ones to increase the total number of papers published. A comprehensive guide to ethical writing published by Roig[35] summarizes the nature of self-plagiarism.

A discussion of ghostwriting deserves mention.[36-41] Ghostwriters may be hired by industry to write a paper to promote and market, most commonly, a drug or device, including off-label uses. The company often has rights to the study design and final publication. The company may pay a leading academic to be a lead author without full disclosure of the relationship and study origin, and without authorship by the ghostwriters. In addition, companies may enlist authors and other physicians as spokespeople on speakers' bureaus with financial remuneration as part of the marketing scheme. Some find this relatively common practice justifiable, others find it deplorable.

Industry and academia relationships can be ethical and advance science. Many in industry are absolutely dedicated to and aware of the tremendous public health benefit of rigorous research on their products proved effective by independent academic physicians and institutions. However, innumerable examples from the tobacco to drug to device industries also document the detrimental effects of ghostwriting to the public and the integrity of medicine and science, with a fundamental purpose to "sell more, make more."[36-39] The public awareness and scrutiny of ghostwriting and pharmaceutical company—academia relationships is increasing and has resulted in litigation where outrageous examples of the nature of the problem have been publicly exposed. The World Association of Medical Editors has described ghostwriting as "dishonest and unacceptable."[41]

The take-home message for all of these scenarios is to always disclose any potential issues to the editor and to send copies of overlapping papers with the submission, reference them, and explain them in a cover letter. The Committee on Publication Ethics was formed in 1997 to assist editors to report, catalogue, and initiate investigations into ethical breaches before and after publication. Their World Wide Web site is also educational to help understand what constitutes potential ethical breaches in the publication process.[32]

SUBMISSION

Read "Instructions for Authors" thoroughly and conform exactly. Write a cover letter and suggest

reviewers for journals that allow. Choose a journal that makes sense for the manuscript submitted and critically ask yourself why the paper is best submitted there. Editors and reviewers like papers with: interest to their readership, originality, importance, clear questions, correct methods, and excellent style. Editors and reviewers spend hours reading manuscripts and greatly appreciate receiving papers that are easy to read and edit. They dislike: long wordy papers, poor style, conclusions not justified by data (sweeping conclusions), inability to follow "Instructions to Authors," and careless sloppy mistakes. The review process ends in one of 3 ways, acceptance, revision, or rejection.

POSTREVIEW PHASE—REVISION

Listen to the reviewers objectively and without high emotion, use coauthors, and respond to reviewers while calm and collected. View every criticism as an opportunity to better explain your point or strengthen your paper. It is essential to be open to criticism in a constructive mindset and not get defensive. Resist the desire to respond that "the reviewer is mindless, I meant XYZ." Revise the paper so that "XYZ" is apparent even to the most mindless reviewer! Carefully prepare responses to reviewers point by point.[42] The easiest way to prepare a point-by-point response is to list each comment verbatim followed by the response. This makes the revision review easier to follow for reviewers and editors. Each comment should be addressed, stated, and obvious. Editors and reviewers appreciate that the reviewer may be wrong.[42,43] However, it is advisable to be considerate; the next reviewer may be the same.

REJECTION

Rejection is always disappointing. It is a fact that even the best scholars and writers submit papers that are rejected or require major revisions. Good papers get rejected for a number of reasons. The number of journal pages available has not kept pace with the number of articles and authors. There may be nothing basically wrong with the manuscript. For the journal's purposes, it may be more confirmatory than original. Insufficient journal priority and backlog inventory are potential indications of submission to the wrong journal at the wrong time.[42]

On the other hand, per a quote attributed to Samuel Johnson, "Your manuscript is both good and original, but the part that is good is not original, and the part that is original is not good."[44] Some of the more common reasons for rejection include: poorly written/poor style, sweeping conclusions unjustified by data, lack of IRB approval, flawed or poor study design (methods), lack of proper controls, nonrandomized interventions, inadequate sample size, faulty statistical analysis, and hypothesis not adequately tested.

The postreview rejection (and revision) phase follows a quote attributed to Franklin Jones: "Honest criticism is hard to take, particularly from a relative, a friend, an acquaintance, or a stranger."[45] Address all of the reviewers' concerns for resubmission to another journal and remember that the next reviewer may be the same. Try to put things into perspective—it is a manuscript, go forward. More than half of rejected articles are eventually published somewhere else.[46]

Appeal is an option but it is usually best not to call the editor directly, especially when angry or upset. Editors are willing to consider first appeals but the author must revise the paper and clearly refute criticisms, not just say the subject is important or the reviewers are wrong or biased. The most experienced editors appreciate the common inverse correlation between author response hostility and quality of submission. Some papers are accepted on appeal, but remember that plenty of other journals exist.[42,46]

BECOME A REVIEWER

Becoming a reviewer often results in becoming a better writer. The best reviewers are often the best writers and vice versa. Approach the editors and editorial staff; they are author advocates and love a great article and a great review.

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