Writing Education Studies for Publication

Gail M. Sullivan, MD, MPH

I'm writing a book. I've got the page numbers done.
-*Steven Wright*[1]

Good writing is like a windowpane.
-*George Orwell*[2]

At times an editor's job is akin to a miner excavating for gold: valuable findings may be buried within a wordy, convoluted document that may not follow the author guidelines.[3] Although the *Journal of Graduate Medical Education* receives many papers that present a clear view of the study, other submissions are more opaque. If we consider the background of most education-manuscript authors, this is quite understandable; teaching or directing a residency program provides limited preparation for authoring an education study. On the other hand, reading the scientific clinical literature in a well-reviewed journal is excellent training because there are many parallels between clinical research and education research articles.

Authors are advised to consider their writing style and organization, as well as their content, before submitting articles to medical education journals. This editorial will attempt to provide useful (and clear) suggestions for authors to enhance their publication success (see also TABLES 1 and 2).

Title

Titles must be specific and accurate, and they must attract the reader. Based on the title, most readers decide instantly whether to read the abstract or to click on a link when searching online. The title must be sufficiently specific to allow search engines to locate articles relating to a particular topic. However, title length should not impair rapid reading and comprehension. Just as important, titles need to be accurate and not overstate the study results. The title, ''Checklists improve trainee handoffs,'' includes part of the intervention (''templates'') but not types of trainees, setting, methods, or outcomes. An alternative, but overly lengthy, title could be ''Electronic templates and brief educational workshop improve PGY-1 pediatric resident completion of hospital handoff form elements through PGY-3 year: a randomized controlled trial in 3 pediatric programs.'' A better alternative is ''Impact of a multisite, randomized, controlled trial of pediatric resident workshops on hospital handoffs.'' For titles, descriptive labels that avoid jargon are preferable.

Introduction

In researching a topic, authors likely have amassed a large number of articles, abstracts, websites, and books. Authors should remember they are describing their own research, not writing a review of the topic. To that end, careful selection of articles to support the need for the study is critical. Authors should start with 1 to 3 sentences in support of the topic's importance and relevance to the journal's usual audience. Next, it is essential to document the current state of the evidence on the topic, in particular, the research or evidence gap that the study will attempt to fill. If there is no research gap, there is no reason to study the issue or publish the results.

One to two paragraphs is usually sufficient to review the pertinent evidence related to the study and should lead directly to a clear statement of the research question or hypothesis. Once the author has defined the research gap, the question will flow naturally. Often, there is more than one hypothesis or question. If so, those hypotheses or questions should be stated in the order they will be addressed in the ''Methods,'' ''Results,'' and ''Discussion'' sections. That is, authors should maintain the framework for presenting the evidence gap and subsequent hypotheses in parallel throughout the paper. This will enhance readers' understanding.

Methods

The ''Methods'' section can be viewed as a recipe: include all steps, so that others can replicate the study. Often, the ''Methods'' section will benefit from the use of subsections to enhance organization. Just as a clinical case presentation has a typical order, so does the ''Methods'' section. Settings and participants, educational interventions, outcome measures, analyses, and statements about Institutional Review Board approval or exemption are the usual components. Additional subsections may be needed for studies that started with a needs assessment, developed and/or validated their own outcome measures, or used qualitative methods. Extremely complex methods may require a table or online supplemental appendix. Material that is in a table or appendix should not be repeated in the text of the paper.

Gail M. Sullivan, MD, MPH, is Editor-in-Chief, *Journal of Graduate Medical Education.*

Corresponding author: Gail M. Sullivan, MD, MPH, University of Connecticut, 253 Farmington Avenue, Farmington, CT 06030-5215, 860.679.3863, gsullivan@nso1.uchc.edu

DOI: http://dx.doi.org/10.4300/JGME-D-12-00044.1

TABLE 1 **General Guidelines for Education Research Article Elements**

Section	Suggested Elements	Suggested Length[a]
Title	Who—subjects	Usually no more than 15 words
	What—intervention	
	Where—setting	
	How—type of study, if possible	
	Outcome	
Abstract	Introduction—essential background and study question	1–2 sentences
	Methods—setting, participants, and research design	Several sentences
	Results—the major findings	Several sentences
	Conclusions—the answer to the study question	1–2 sentences
Introduction	Why topic is important to the readers of this journal	1–3 sentences
	Research or evidence gap that exists	1–2 paragraphs
	Research hypothesis or question to fill gap	1–2 sentences
Methods	Subsections as appropriate:	
	Setting and participants	
	Intervention	
	Outcomes	
	Analysis	
	IRB statement (exempt, approved, or not applicable)	1 sentence
Results	Same order as hypothesis (or hypotheses) and methods	
	Tables and figures, if easier to follow data	
Discussion	Restatement of key study findings	1–3 sentences
	Comparison to others' findings	
	Explanation of differences with others' findings	
	Limitations and alternative explanations for findings	
	Study strengths (how limitations minimized)	
	Next steps	
Conclusions	Summarize your findings: answer the study question	1–3 sentences

Abbreviation: IRB, Institutional Review Board.

[a] For sections in which the length is highly variable and dependent on the type of article, this column will be blank.

Similarly, the educational intervention under study must be clearly and thoroughly described, as well as the comparison intervention (or control) to which the new intervention is compared. Often, a major impetus to publish a study is to disseminate a promising new educational intervention. Thus, sufficient information for others to replicate the intervention is essential. If the necessary details exceed the word limit, additional information may be placed in an online supplemental appendix. Alternatively, statements such as "A copy of the multiple-choice test is available from the authors" or "Detailed content of all didactic sessions is available from the authors" may suffice.

A description of the data analysis should be complete and clear to readers who may not be statistical experts. Studies that include humans and research require a statement regarding Institutional Review Board exemption or approval or a similar process used in countries other than the United States.

When in doubt, authors should err on the side of providing more information in the "Methods," rather than less, but avoid repetition.

Results

The results focus on the findings, not the authors' interpretations or the implications of the findings: "just the facts" should be the guide. "Results" should be organized

TABLE 2 **Common Problems in *Journal of Graduate Medical Education* Research Submissions**

Section	Problem
General	Paper does not follow the author guidelines
	Paper is more than the word count for its submission type, and an explanation for this increase is not included in the authors' cover letter
	Paper has not been proofread for typographical errors, grammar, spelling, etc
Title	Omits essential information (eg, discipline of trainees studied)
	Overstates findings
	Overly long and difficult to read
Abstract	IMRC format omitted (Introduction, Methods, Results, Conclusions)
	Conclusions lengthy
	Conclusions overstate findings
Introduction	Introduction is a lengthy review of the topic
	Introduction does not reveal the evidence gap that exists
	No research hypothesis or question stated
Methods	Poor organization
	Educational intervention not described sufficiently for replication by others
	Outcomes, particularly surveys, not provided for reviewers (eg, in Appendix)
	Methods to analyze results not described fully
Results	Results do not follow the frame of hypotheses stated in the Introduction
	The same results are presented in text and table(s)
Discussion	Results and Methods are presented for the first time in the Discussion
	Inadequate discussion of results in light of others' published work
	Limitations listed rather than analyzed as to their potential effects on results
Conclusions	Overly long
	Speculate rather than summarize accurately the study findings
	Overstate findings

using the order of the hypotheses. Many results are easier to read and follow in a table or figure. If so, the data should be presented in that format and removed from the text, which will instead briefly explain the results presented in the table or figure. General results such as the total number of participants and demographic information (age, sex, etc) and secondary results (eg, reliability of the instrument) are usually presented first, followed by primary results. Both the numerator and denominator of results, as well as the percentages, when relevant, need to be provided. When applicable, confidence intervals around estimates must be included in addition to *P* values. If there are multiple or complex results, add subsection labels to aid reader comprehension.

Discussion

The "Discussion" section analyzes the findings; it is not an opportunity for authors to give their own opinions, unless these are clearly stated as such and follow directly from the study results. Usually, this section begins with a statement summarizing the most important, unique, or surprising study results in a short paragraph. Next, authors should compare and contrast their findings with those found by other researchers. It is essential to attempt to explain why results are different when this occurs, whether due to different study times, subjects, settings, interventions, methods, analyses, or other factors. For the diverse readership of *JGME*, comparison to studies outside the authors' specialty is strongly advised as well.

Limitations are often provided by authors in a list, with little analysis. In education research, where the mechanism by which interventions work or do not work is often unknown, the discussion of limitations is a vital part of the manuscript. Authors need to explore alternative explanations for their findings, in light of methodologic or other

limitations, and suggest other study questions or designs that might uncover different results. This important opportunity is often overlooked in contrast to study strengths, which may receive relatively more emphasis. In actuality, the study strengths are a measure of how the limitations of the study were avoided or minimized.

Authors often state that their findings should result in immediate changes to trainee education. However, that must be done within the context of the study's strengths and limitations. Relatively few studies lead to immediate changes in education; change is usually incremental. More beneficial is a brief discussion of planned next research steps.

Conclusions

"Conclusions" will follow naturally from the study findings. Typically, 1 to 3 sentences, the "Conclusions" succinctly summarize the key study findings. Multiquestion studies may require additional sentences for "Conclusions." In essence, the "Conclusions" answer the study question. Avoid nonspecific statements, such as "More research is needed."

References

Although not exhaustive, the references should be complete and up to date. An initial PubMed search to determine the state-of-the-science regarding the topic and to establish the need for the project is insufficient; it is wise to check for more recent publications just before submitting the manuscript to the journal. Follow the guidance on the "Information for Authors" regarding the correct reference format. Reference software can expedite manuscript writing. For example, if recorded in an online program, such as RefWorks (Bethesda, Massachusetts), or software, such as EndNote (Thomson Scientific, Carlsbad, California), references may be added with a click from online resources in the style format matching the journal guidelines.

Abstract

For many, if not most, articles, the "Abstract" is the only part of the article that is read. The format of the "Abstract" needs to follow the author guidelines for the journal of interest. For *JGME*, the elements of the "Abstract" are "Introduction," "Methods," "Results," and "Conclusion." Each section is a brief summary with sufficient data for readers to decide whether to read the full article.

Current *JGME* submissions frequently do not adhere to the desired "Abstract" format. Also, these "Abstracts" may have overly long "Introductions" and "Conclusions," with relatively brief "Methods" and "Results." The "Introduction" and "Conclusions" can usually be described in one or two sentences each. For "Introduction," describe the research gap and research question, and for "Conclusions," give the answer to your hypothesis that results from the study.

Writing Strategies

Many experienced authors suggest that one should start writing the paper simultaneously with planning the research study. As articles are read for background, introduction statements or phrases may be crafted. "Methods" can be described as they are finalized. "Results" that are shared with coauthors in tables or figures may become the backbone of the "Results" section. Naturally, the "Discussion" and "Conclusions" will be written last, after much discussion with coauthors and mentors.

The guidance provided by this editorial may serve as an outline for the manuscript, with appropriate alterations for multiproject studies, qualitative studies, and different journals. With this outline in mind, one can fill in details to illuminate the story of the work. Concentrating first on content and later on word choice and grammar is highly recommended.[4] Focus first on getting words down in the correct section rather than editing closely.

After filling in the outline with content, phrases and lists must be converted into clear, fluent prose; this takes practice as well as help from skilled mentors. Keep in mind that scientific writing should use active voice when possible and that it is acceptable to use the first person "I" or "we," in the "Methods" section, to avoid passive tense. Use of first person to present authors' opinions or interpretations is also suitable.

Editors and reviewers find frequent typographic and other errors annoying, and thus, authors should use the spelling and grammar-checking functions in computer software programs. After your own proofreading, it is advantageous, even for experienced writers, to have someone else read the paper for clarity and potential errors. The *Journal of Graduate Medical Education* advises nonnative English speakers to ask a native speaker to read the paper closely. Websites that identify common errors may be helpful as well.[5] Journals vary in the extent to which editors provide writing assistance after manuscript submission. Although *JGME* editors on occasion provide authors with writing assistance, review and feedback from colleagues and mentors should be the author's first resource.

To enhance the likelihood of a favorable review: *Always follow the author guidelines*.

Clinician educators and education researchers should no longer dread putting pen to paper (or fingers to keyboard). Refer to this editorial, read the references

below,[4,6,7] or visit the *JGME* website for questions about your masterpiece-in-progress. Together, our goal will be to move quickly beyond page numbers and toward a transparent window on your work.

References

1 BrainyQuote.com. Steven Wright. Chicago, IL: Xplore Inc; 2012. http://www.brainyquote.com/quotes/quotes/s/stevenwrig161265.html. Accessed January 23, 2012.

2 BrainyQuote.com. George Orwell. Chicago, IL: Xplore Inc; 2012. http://www.brainyquote.com/quotes/quotes/g/georgeorwe189107.html. Accessed January 23, 2012.

3 Journal of Graduate Medical Education. Author instructions. http://jgme.org/userimages/ContentEditor/1253910894503/Instructions_for_Authors.pdf. Updated November 2011. Accessed March 14, 2012.

4 El-Serag HB. Writing and publishing scientific papers. *Gastroenterology*. 2012;142(2):197–200.

5 Perelman LC, Paradis J, Barrett E. Common writing problems for non-native speakers of English. In: Perelman LC, Paradis J, Barrett E, eds. *The Mayfield Handbook of Technical Scientific Writing*. Mountain View, CA: McGraw-Hill; 2001. http://www.mhhe.com/mayfieldpub/tsw/esl-link.htm#article. Accessed February 7, 2012.

6 Davidson AJ, Carlin JB. What a reviewer wants. *Paediatr Anesth*. 2008;18(12):1149–1156.

7 Johnson TM. Tips on how to write a paper. *J Am Acad Dermatol*. 2008;59(6):1064–1069.