Ethical considerations in scientific writing

Jane D. Carver, Ben Dellva, Patricia J. Emmanuel, Ritu Parchure[1]
Department of Pediatrics, University of South Florida, and Clinical and Translational Science Institute (USF-CTSI), Tampa, Florida USA, [1]Prayas, Pune, India

Address for correspondence:
Dr. Patricia Emmanuel, Department of Pediatrics and Clinical and Translational Science Institute, 17 Davis Blvd. Suite 200, Tampa, FL 33606. E-mail: pemmanue@health.usf.edu

INTRODUCTION

Fostering scientific advancement requires strict adherence to ethical guidelines for research and scientific writing. Several professional organizations have policies to address the ethics associated with scientific writing and publishing, including the Committee on Publication Ethics and the International Council of Medical Journal Editors (ICMJE); the majority of medical journals follow the ICMJE's Uniform Guidelines. We discuss two issues related to ethics in scientific writing: Plagiarism and authorship. Plagiarism, the most common form of scientific misconduct, is defined as the appropriation of another person's ideas, processes, results or words without giving appropriate credit. While plagiarism is often intentional, it may be unintentional due to confusion regarding the definition of plagiarism and how to avoid it. Other forms of plagiarism include self-plagiarism, whereby authors copy large parts of one of their previous manuscripts word-for-word. Duplicate publication is a form of plagiarism that occurs when an author submits a previously-published work as if it were original. An increasing number of manuscripts are retracted each year due to duplicate publication. The incidence of plagiarism is of particular concern among international trainees in the U.S. and in countries where English is not the primary language, and is often due to issues related to language barriers.

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The major issues related to authorship include determination of author responsibilities and author order. Awarding authorship to people who have not made sufficient contributions conveys benefit to them inappropriately and it reduces benefit to those who actually contributed to the work, while denying authorship to deserving contributors is a widespread violation of scientific integrity.

The benefits of research can only be realized if results of investigations are published in the literature for others to replicate and expand upon. Fostering scientific advancement requires strict adherence to ethical guidelines for research and scientific writing. Here, we discuss two issues related to ethics in scientific writing: plagiarism and authorship. Violations of the ethical principles associated with these issues are considered as scientific misconduct. However, authors and academic institutions often have difficulty in defining and addressing these complex issues. Fortunately, several professional organizations have developed policies to address these and other issues associated with the ethics of scientific writing. These policies can be readily adopted – and adapted – by academic institutions, but the process still requires that the policies be consistently adhered to. The Committee on Publication Ethics (COPE)[1] defines best practice in the ethics of scholarly publication. The COPE's Code of Conduct and Best Practice Guidelines for Journal Editors, ascribed to by many major journals, defines ethical violations that involve publication issues, and provides guidelines for editors and publishers in dealing with these violations. The International Council of Medical Journal Editors (ICMJE)[2] developed the uniform requirements for manuscripts submitted to biomedical journals. The majority of medical journals

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follow the uniform guidelines, which provide guidance on many issues including plagiarism and authorship standards. The U.S. Office of Research Integrity (ORI)[3] oversees and directs public health research in the U.S. The ORI develops policies and procedures related to detecting, investigating and preventing research misconduct, and it implements programs to promote research integrity.

Plagiarism

Case study

While preparing his dissertation, a graduate student used a colleague's previously-submitted paper to compose much of the introduction and background sections. The professor recognized the duplication and questioned the student. The student argued that the methods, results and discussion section are all original, and the background is mostly common knowledge. He admitted to using the colleague's paper but felt that he had changed enough words, and that citation wasn't necessary because the information was common knowledge.

The U.S. Office of Science and Technology defines plagiarism as "the appropriation of another person's ideas, processes, results or words without giving appropriate credit, including those obtained through confidential review of others' research proposal and manuscripts."[4] Although plagiarism is considered as a form of scientific misconduct, it is often unintentional. Inexperienced writers and trainees may not be aware of the importance of strict adherence to plagiarism guidelines, they may be confused by vague and conflicting definitions of plagiarism, faculty may assume that trainees understand what plagiarism is and how to avoid it, and authors often have difficulty in paraphrasing complex ideas or methods.[5,6] Further complicating the issue is that institutions in some countries may not require strict adherence to plagiarism guidelines.

Plagiarism, the most common form of scientific misconduct, occurs quite often among students and faculty. Studies have documented persistent plagiarism among medical students, and have found that explicit warnings may not be enough to deter students from engaging in plagiarism.[7] Faculty at research institutions may succumb to plagiarism due to the tremendous pressure to publish their work, which is essential to effectively compete for grant money and to advance their careers.

It has been noted that the incidence of plagiarism is higher among international versus domestic trainees in the U.S. This difference is mainly attributed to differing perspectives of international students toward plagiarism, the lack of formal policies on research misconduct at their home institutions, and language barriers causing difficulties in writing English.[6] Plagiarism in countries where English is not the primary language is also a significant concern.[7] English is often the preferred language to communicate scientific ideas and results, and there is increasing pressure to publish papers in reputable English-language journals. However, many faculty and trainees are not skilled in expressing complex ideas in English. This language barrier, along with the ease of internet searches and the ability to "cut and paste" verbiage from Web pages, contribute to the increasing incidence of plagiarism. In all academic settings, the increasing pressure to publish as an important step in advancing careers further contributes to the increasing incidence of plagiarism. The Indian government, in particular, has expressed concern about the country's low research output, and its revised rules for academic promotion link the number of published papers to promotions.[8] If institutions and faculty are to be competitive in the global research arena, better policies to address research misconduct need to be developed, and training in the skill of scientific writing needs to be recognized as a critically important priority.

Several different forms of plagiarism encountered in scientific writing

Intentional plagiarism, in which one knowingly lifts text directly from other authors without giving appropriate credit, is the most common form of plagiarism. Fisher and Zigmond[5] believe the common factors that underlie intentional plagiarism are an individual's strong desire to succeed, coupled with a lack of time and lack of interest in learning how to write properly. As in the case study above, some authors may view "common knowledge" in their field quite broadly. However, even basic background information needs to be properly cited, both to give credit to the original author(s) and to aid readers in finding the information provided. When compiling background and introduction sections, it can be easy to lift phrases directly from notes taken from primary sources. However, it is important to remember that taking text directly from a source requires proper citation and the use of quotation marks when word-for-word text is cited.

Self-plagiarism

Also known as text recycling, is another common form of plagiarism. In self-plagiarism, the author copies large parts of one of his or her previous papers word-for-word. This form of plagiarism can be difficult to define, since there is no consensus

on how many words of copied text constitute self-plagiarism. Although the ethical breach associated with self-plagiarism is generally less severe than with intentional plagiarism, it is still considered as scientific misconduct. Copying sections of previously published text, for example the methods section of a research paper, is occasionally legitimate. However, copying large parts of an original paper is considered as self-plagiarism, and submitting it for publication is considered as duplicate publication, as discussed below.[9]

Duplicate publication is a form of plagiarism that occurs when an author submits for publication a previously-published work as if it were original. Submitting previously published work is considered as plagiarism and a form of scientific misconduct, unless the author makes a clear statement that the article is being intentionally republished in part or in whole. Duplicate submission of manuscripts wastes the time of the editor and reviewers. Worse yet, duplicate publication of research distorts the scientific record, since it implies that more than one study has independently achieved the reported results. Readers of published manuscripts have a right to expect that what they read is original content, and they should not be misled into believing a report is original when it is a duplication of the author's own work or that of others.[10] At the time of submission, most journals require that authors make a statement about any previous submissions that were similar or that were based on the reported results. Some forms of duplicate publication are acceptable, such as clinical trial updates and conference proceedings. According to the ICME guidelines,[2] submitted manuscripts that are duplicates should be promptly rejected. If the editor is not made aware of the violation prior to publication, a notice of duplicate publication may be published with or without the author's explanation or approval.

The number of published manuscripts that are retracted each year is increasing, and plagiarism is making a significant contribution to this increase. Steen[11] investigated the reasons for retraction of 742 English language research papers from PubMed between 2000 and 2010. Sixteen percent of papers were retracted due to duplicate publication and 14% were retracted due to plagiarism. Errami and Garner[10] also searched the published biomedical literature and reported tens of thousands of highly similar articles, and that the number is growing. In their commentary in Nature, the authors state that the "three major sins of modern publishing" are duplication, co-submission and plagiarism.

Academic institutions are increasingly using plagiarism detection software to detect plagiarism in documents submitted by students. Likewise, journals use software tools to detect plagiarism and duplicate publications among submitted manuscripts. Plagiarism detection software compares the text of manuscripts with a database of the existing scholarly literature. The Lancet, which recently adopted the use of plagiarism detection software,[12] screens all submitted papers before sending them for peer review. If there is substantial overlap with previously published material, the editors may ask authors to put text in quotation marks, rewrite passages, or they may reject the manuscript and contact the head of the author's institution.

Table 1 lists the U.S. Department of Health and Human Services Office of Research Integrity's "Guidelines for Avoiding Plagiarism". A good rule-of-thumb to follow is to always provide a citation if there is any question about the appropriateness of doing so. Our institution provides an on-line tutorial to assist faculty and students in differentiating plagiarism from paraphrasing,[13] and the student catalog provides specific definitions for plagiarism, along with punishment guidelines.[14] Most published guidelines for avoiding, detecting and dealing with plagiarism emphasize that a multi-faceted approach should be used to ensure that all persons understand the meaning of and consequences of plagiarism.[6, 7,15]

Authorship

Case study

A junior investigator prepared a case series and review article based on a group of interesting patients he has cared for. He worked with one student and a colleague to review the cases and prepare the manuscript, and they were both listed as authors on the paper. When the manuscript was close to completion, the investigator asked his senior mentor to review the manuscript. The mentor returned the paper with several edits and comments, and added his name as the senior author on the paper.

Authorship issues are often contentious and can affect personal and professional relationships. The major issues related to authorship include determination of author responsibilities and author order. There is tremendous pressure among academicians to be listed on as many publications as possible, and students in many graduate programs are required to publish one or more first-authored papers. However, awarding authorship to people who have not made sufficient contributions conveys benefit to them inappropriately,

and it reduces the benefit to those who actually contributed to the work.[16]

Several forms of authorship abuse described by Kevin Strange[16]

- Coercion authorship, where intimidation is used to gain authorship. This type of authorship can occur when a senior person pressures a more junior person or a student to include their name on a paper to which they have not contributed enough to qualify for authorship;
- Honorary, guest or gift authorship that is awarded to acknowledge friendship, to gain favor, and/or to give the paper a greater sense of legitimacy. It is still quite common for authors to add well-known senior investigators as authors to their papers, even though the senior person may not have made significant contributions to the paper;
- Mutual support authorship, whereby two or more investigators place their names on each other's papers to enhance their perceived productivity;
- Ghost authorship, where papers are written by people who are not included as authors or are not acknowledged. Ghost authorship is quite common in the pharmaceutical industry, which often hires professional writers.
- Denial of authorship, where a work is published without providing authorship or acknowledgement to people who made substantial contributions to the work.

In the case described above, the senior mentor may expect to be added to the junior faculty member's paper because he feels that his position of authority qualifies him for authorship, and/or because he feels that he substantially contributed to the content through his edits and comments. However, even if he did make substantive changes and suggestions, the junior faculty member should not be made to feel coerced into adding the senior mentor as an author. The junior investigator should be able to confidently refer to published guidelines of authorship to determine if the senior mentor qualifies for authorship – and he should have the support of his institution in making this determination.

An often overlooked aspect of authorship is that the agreement implies support for the findings of the study, and a willingness to take public responsibility for the paper. Dr. Strange[16] describes several high-profile cases in which investigators inappropriately accepted authorship on papers. When serious charges of scientific misconduct were filed against the authors, the inappropriate authors tried to distance themselves from the study – after implicitly supporting the findings by accepting authorship. These cases illustrate the importance of not accepting authorship inappropriately, and of accepting the responsibility that accompanies authorship.

As with plagiarism, many institutions and professional organizations have established formal authorship guidelines. The U.S. Department of Health and Human Services Office of Research Integrity recommends that all research institutions, journals and scientific societies establish and make public their authorship policies.[3] The ICMJE's standards for authorship have been revised several

Table 1: The U.S. Department of Health and Human Services Office of Research Integrity's "Guidelines for Avoiding Plagiarism".[3]

• Always acknowledge the contributions of others and the source of your ideas.
• Enclose in quotation marks any verbatim text taken from another author.
• Always acknowledge every source used in writing, whether you paraphrase it, summarize it or enclose it in quotations.
• When paraphrasing or summarizing others' work, reproduce the exact meaning of the other author's ideas or facts using your own words and sentence structure.

Table 2: Abbreviated version of the International Medical Journal Editors' "Guidelines for Authorship".[2]

• Listed authors should meet each of the following conditions: 1. Made substantial contributions to the conception and design, acquisition of data, or analysis and interpretation of data; 2. Drafted the article or revised it critically for important intellectual content; and 3) Gave final approval of the version to be published.
• Large, multi-center groups should identify the people who accept direct responsibility for the manuscript.
• Acquisition of funding, collection of data or general supervision of the research group alone does not necessarily qualify one for authorship
• All persons designated as authors should qualify for authorship, and all those who qualify should be listed as authors.
• Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the document.
• Contributors who do not meet criteria for authorship should be listed in the acknowledgements section.

times, have been adopted by hundreds of journals, and are the most widely accepted[2] [Table 2]. In general, the ICMJE recommends that authorship be reserved for those who made substantive intellectual contributions to a published study.

Another authorship issue that can be problematic is authorship order. Generally speaking, the first and last author positions are considered as the most desirable. The first author, or "primary author", is the person who conducted most of the work described in the paper, and is usually the person who drafted the manuscript. The "senior author" is usually the last person named, and is generally the person who directed or oversaw the project. Senior authors are often expected to take responsibility for the project as a whole. The names of "contributing authors'" appear between the primary and senior authors, and the order should reflect their relative contribution to the work.[16] The importance of these designations to medical school promotion committees, and clarification of these designations in published manuscripts have been described.[17] Increasingly, journals require that the role(s) of each listed author be specified at the time of submission, and many journals publish this information with the article.

CONCLUSIONS

Ethical lapses in writing and publishing are all too common. The cases presented illustrate a very small sample of the complex issues authors may face. We encourage institutions to adopt formal policies related to scientific misconduct – including plagiarism and authorship. Numerous established policies are available that can be adopted – or adapted – to meet the needs of individual institutions. Institutions should make their policies related to plagiarism readily available to both students and faculty, and they should provide clear guidelines to help students and faculty recognize and avoid plagiarism. Defining roles on projects and establishing authorship order on manuscripts before the writing begins – or even before the project begins – can often circumvent misunderstandings related to authorship. Authors should also clarify authorship expectations when they ask colleagues to review a working manuscript, and when they invite a colleague to participate on a project. Team science can help to foster ethical publishing if the team establishes guiding principles of authorship and publishing, and holds each member accountable to these principles.

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