Introduction to the Responsible Conduct of Research

Nicholas H. Steneck

illustrations by David Zinn
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RESEARCH HAS NO VALUE IF IT IS NOT MADE public. Results are shared with colleagues so they can be tested, used to advance knowledge, and put to work. They are shared with the public and policymakers so that they can be used to make decisions about funding and practical application.

While researchers might engage in research simply for their own satisfaction, if their work receives public support, they have a responsibility to share that work with others.

Chapter 9, *Authorship and Publication*, covers the responsibilities researchers have when they share results with others through informal communications, oral presentations, scholarly publications, and public statements. Whatever mechanism is used, research results should be shared honestly, efficiently, and without bias. Dishonesty and bias undermine the usefulness of research publications; inefficiency (publishing the same research several times) wastes public funds and the valuable time of reviewers and journal editors.

Chapter 10, *Peer Review*, describes the responsibilities researchers have when they review the work of other researchers. Non-peers—individuals who do not have equal training and knowledge—cannot evaluate the quality and importance of research. Peers can and therefore play a crucial role in many important decisions about the funding, publication, and use of research.
Researchers share the results of their works with colleagues and the public in a variety of ways. Early results are usually shared during laboratory meetings, in seminars, and at professional meetings. Final results are usually communicated to others through scholarly articles and books. Public communication takes place through press releases, public announcements, newspaper articles, and public testimony. Some of these ways of communicating research results (i.e., of publication) are well structured and controlled; others are informal and have few controls.

Whether structured or informal, controlled or free ranging, responsible publication in research should ideally meet some minimum standards. All forms of publication should present:

### Case Study

As his first major grant is coming to an end, several important elements of Dr. Sanjay K.’s research suddenly fall into place. The last series of experiments his graduate student ran clearly link the gene they are studying to a particular type of cancer. His postdoc’s work on the proteins associated with this gene could pave the way for possible cures. With these results in hand, he is finally ready to make a strong case for continued support and, happily, his pending promotion. All he has to do now is publish the results.

A week later, Sanjay’s optimism starts to fade. As might have been expected, his department chair was delighted with his progress, but then suggested that the first paper announcing the results come out under her name to give it broader circulation. Meanwhile, his postdoc and graduate student have gotten into a heated debate about the order their names should appear on the paper; the university’s public affairs office has asked for a summary of the results for a press release; and the technology transfer office has called telling him to hold all publications until they can evaluate the commercial potential of his work.

What should Sanjay do?

Which of these problems should Sanjay tackle first?

Is there anything he could have done to assure that things went more smoothly when he was ready to publish his results?
✓ a full and fair description of the work undertaken,
✓ an accurate report of the results, and
✓ an honest and open assessment of the findings.

In assessing the completeness of any publications, researchers should ask whether they have described:
✓ what they did (methods),
✓ what they discovered (results), and
✓ what they make of their discovery (discussion).

It is, however, not as easy as one might anticipate to meet these expectations.

9a. Authorship

The names that appear at the beginning of a paper serve one important purpose. They let others know who conducted the research and should get credit for it. It is important to know who conducted the research in case there are questions about methods, data, and the interpretation of results. Likewise, the credit derived from publications is used to determine a researcher’s worth. Researchers are valued and promoted in accordance with the quality and quantity of their research publications. Consequently, the authors listed on papers should fairly and accurately represent the person or persons responsible for the work in question.

Contribution. Authorship is generally limited to individuals who make significant contributions to the work that is reported. This includes anyone who:
✓ was intimately involved in the conception and design of the research,
✓ assumed responsibility for data collection and interpretation,
✓ participated in drafting the publication, and
✓ approved the final version of the publication.

There is disagreement, however, over whether authorship should be limited to individuals who contribute to all phases of a publication or whether individuals who made more limited contributions deserve authorship credit.

The widely accepted Uniform Requirements for Manuscripts Submitted to Biomedical Journals, authored by the International Committee of Medical Journal Editors (ICMJE), sets a high standard for authorship. It recommends limiting authorship to persons who contribute to the conception and design of the work or to data collection and interpretation and, in addition, play an important role in drafting and approving the final publication. Anyone who plays a lesser role can be listed under acknowledgments but not at the beginning of the paper as an author.

As influential as they are, the ICMJE recommendations on authorship are not uniformly followed, even in journals that subscribe to the ICMJE Requirements. Practices for determining authors vary considerably by discipline and even from laboratory to laboratory. This places most of the responsibility for decisions about authorship on the researchers who participated in the work reported in each publication.

ICJME Statement on Authorship

All persons designated as authors should qualify for authorship, and all those who qualify should be listed. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content. One or more authors should take responsibility for the integrity of the work as a whole, from inception to published article.

Authorship credit should be based only on 1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; and 3) final approval of the version to be published. Conditions 1, 2, and 3 must all be met. Acquisition of funding, the collection of data, or general supervision of the research group, by themselves, do not justify authorship.

Authors should provide a description of what each contributed, and editors should publish that information. All others who contributed to the work who are not authors should be named in the Acknowledgments, and what they did should be described.

http://www.icmje.org/
publication. These decisions are best made early in any project, to avoid misunderstandings and later disputes about authorship.

**Importance.** Authors are usually listed in their order of importance, with the designation first or last author carrying special weight, although practices again vary by discipline. Academic institutions usually will not promote researchers to the rank of tenured faculty until they have been listed as first or last author on one or more papers.

As with the principle of contribution, however, there are no clear rules for determining who should be listed as first author or the order in which other authors should be listed. The ICMJE Requirements simply note that:

The order of authorship on the byline should be a joint decision of the coauthors. Authors should be prepared to explain the order in which authors are listed.

Some journals have specific rules for listing authors; others do not, again placing most of the responsibility for this decision on the authors themselves.

**Corresponding or primary author.** Many journals now require one author, called the corresponding or primary author, to assume responsibility for all aspects of a publication, including:

- the accuracy of the data,
- the names listed as authors (all deserve authorship and no one has been neglected),
- approval of the final draft by all authors, and
- handling all correspondence and responding to inquiries.

In accepting this responsibility, corresponding authors should take special note of the fact that they are acting on behalf of their colleagues. Any mistakes they make or fail to catch will affect their colleagues’ as well as their own careers.

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**9b. Elements of a responsible publication**

Each element of a publication serves an important purpose and must be carefully prepared to make sure it serves that purpose.

**Abstracts.** Abstracts summarize the content of publications in sufficient detail to allow other researchers to assess relevance to their own work. Abstracts, therefore, should neither understate nor overstate the importance of findings. Negative results that might be important to other researchers or the public should be mentioned. The data presented in the abstract should be the same as the data presented in the body of the publication—an obvious requirement, but one that studies of publication practices show some authors do not follow (see Pitkin, Additional Reading).

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**Standards for Reporting Research Results**

**The CONSORT Statement**

**Abstract**

To comprehend the results of a randomized controlled trial (RCT), readers must understand its design, conduct, analysis, and interpretation. That goal can be achieved only through complete transparency from authors. Despite several decades of educational efforts, the reporting of RCTs needs improvement. Investigators and editors developed the original CONSORT (Consolidated Standards of Reporting Trials) statement to help authors improve reporting by using a checklist and flow diagram. The revised CONSORT statement presented here incorporates new evidence and addresses some criticisms of the original statement.

The checklist items pertain to the content of the Title, Abstract, Introduction, Methods, Results, and Discussion. The revised checklist includes 22 items selected because empirical evidence indicates that not reporting the information is associated with biased estimates of treatment effect, or because the information is essential to judge the reliability or relevance of the findings. We intended the flow diagram to depict the passage of participants through an RCT. The revised flow diagram depicts information from four stages of a trial (enrollment, intervention allocation, follow-up, and analysis). The diagram explicitly shows the number of participants, for each intervention group, included in the primary data analysis. Inclusion of these numbers allows the reader to judge whether the authors have done an intention-to-treat analysis.

To ensure completeness and accuracy, many journals now use structured abstracts. This assures that all of the key elements of the publication are mentioned and easily identified. With scientific publications now running in the millions per year in well over 100,000 journals, researchers cannot read all seemingly relevant publications in detail. They must rely on abstracts to point them to important developments and findings.

Methods. Researchers cannot check and build on the work of others without knowing how it was conducted. Methods therefore should be described in sufficient detail to allow other researchers to replicate them. When researchers use well-established methods, this section of a publication can be shortened, provided appropriate references are given to a full description of the methods along with any changes that have been made. New or unique methods should be described in more detail to allow other researchers to replicate the work.

Results. Research results should be reported in sufficient detail to allow other researchers to draw their own conclusions about the work. This does not mean that every piece of recorded data should be reported. Researchers can and must process their raw data before publication (to keep publications to a reasonable size if for no other reason). However, results should not be left out just because they do not agree with the conclusions the authors would like to reach. The results section should represent a complete summary of what was discovered, leaving interpretations for the closing discussion.

Discussion. Researchers can and should evaluate the significance of their findings under discussion—also called conclusion or summary. This portion of a publication helps those who are less familiar with the field understand the importance of the findings. It also provides a venue for identifying unresolved problems and future research needs.

Since the discussion is read by individuals who may not be able to evaluate its validity, it is particularly important that authors avoid bias and one-sided reporting in this section. Cautions and other interpretations should be mentioned along with the limitations of the study to provide a balanced view of the reported results. Review articles (articles that survey research findings in particular areas) should make an honest effort to cover all relevant work. It is not always easy to recognize one’s own biases, which is a good reason to ask colleagues to read and comment on manuscripts before they are submitted for publication.

Notes, bibliography, and acknowledgments. Notes, bibliography, and acknowledgments should be used to place publications in context and to give credit to others for their ideas, support, and work. They serve to:

- Provide support for important statements of fact or assumptions,
- Document the work of others used in the publication,
- Point to additional reading and resources, and
- Recognize the support of funding agencies or colleagues and staff who do not qualify as authors.

Since others rely on and trust this information, it, along with every other element of a responsible publication, should be fair and accurate.

9c. Practices that should be avoided

Competition in research for funding and recognition places considerable pressure on researchers to publish. Ideally, quality should matter more than quantity, but in reality quantity—the number of articles published—is often used as a measure of productivity and ability. However, no matter how important it may be to publish, some publication practices should be avoided.
Honorary authorship. The practice of listing undeserving authors on publications, called “honorary” authorship, is widely condemned and in the extreme considered by some to constitute a form of research misconduct. However, common agreement notwithstanding, honorary authorship is a significant problem in research publication today (see articles by Drenth and Flanagan, Additional Reading). Researchers are listed on publications because they:

- are the chair of the department or program in which the research was conducted,
- provided funding for the research,
- are the leading researcher in the area,
- provided reagents, or
- served as a mentor to the primary author.

Persons in these positions can make significant contributions (see left) to a publication and may deserve recognition. However, they should not be listed if these are the only contributions they made.

Salami publication. Salami publication (sometimes called bologna or trivial publication) is the practice of dividing one significant piece of research into a number of small experiments (least publishable units or LPUs), simply to increase the number of publications. This practice may distort the value of the work by increasing the number of studies that appear to support it. It also wastes valuable time and resources. Before an article is published it is reviewed, edited, and in one form or another prepared for publication. After publication it is entered into indexes and databases, such as the National Library of Medicine’s PubMed®. Libraries and individuals purchase the journal in which it is published. If the same information could be summarized in one article as opposed to two, three, or more, everyone involved, from the publishers to libraries and the researchers who have to keep up to date on current information, benefits. Researchers therefore should avoid trivial or salami publication.

Duplicate publication. Duplicate publication is the practice of publishing the same information a second time without acknowledging the first publication. This practice not only wastes time and resources but can also distort the research record and endanger public health.

Researchers rely on meta-analyses (analyses of a group of similar experiments or studies of studies) to improve their understanding of difficult problems. One clinical trial or epidemiological study may not produce clear evidence, but the pooled results of many related studies can. However, if some of the studies in the pooled study (meta-analysis) have been published two or more times without proper notice, the results of the meta-analysis will be unfairly weighted in the
direction of the duplicate publication. Therefore, duplicate publication is not only deceptive but poses real dangers to public health and safety (see articles by Jefferson and Tramer, Additional Reading).

Premature public statements. Academic or scholarly publication practices are designed to assure that the information conveyed to broader audiences through these practices is accurate and fairly presented. While the system is not foolproof and erroneous or biased information is from time to time published, standard publication practices do serve an important quality control role in research. Accordingly, researchers should follow standard publication practices when making research results public and not issue premature public statements about their work before it has been reviewed. From time to time there may be overriding circumstances, such as early indications of a significant threat to public health or safety, but for the most part research results should be made public only after they have been carefully reviewed and properly prepared for publication.

Questions for discussion

1. What are the accepted criteria for authorship in your field of research? If there are none, what should they be?

2. Should researchers be allowed to omit some details from the methods section of their publications until they have had time to patent their methods?

3. What should a researcher do if the journal that has accepted a publication will not let the researcher publish the method or results in as much detail as the researcher feels is necessary?

4. What should a researcher do if an undeserving author in a position of some authority demands authorship status on a paper?

5. What factors should be considered when making a decision to publish the results of a study in one article versus several articles?
Resources

Policies, Reports, and Policy Statements


Additional Reading


10. Peer Review

Peer review—evaluation by colleagues with similar knowledge and experience—is an essential component of research and the self-regulation of professions. The average person does not have the knowledge and experience needed to assess the quality and importance of research. Peers do. Therefore many important decisions about research depend on advice from peers, including:

- which projects to fund (grant reviews),
- which research findings to publish (manuscript reviews),
- which scholars to hire and promote (personnel reviews), and
- which research is reliable (literature reviews and expert testimony).

The quality of the decisions made in each case depends heavily on the quality of peer review.

Case Study

Dr. Sung L. is struggling with the decision whether to agree to review the work of an advanced graduate student at another university for publication in the major journal in his field. He is familiar with the student’s work and attended a session several months ago at which she presented a brief report on her work. It clearly overlaps with his research in a number of ways, which is one reason he has been asked to serve as a reviewer.

Dr. L. knows he is qualified to do the review and is confident he can provide an objective, constructive judgment of the student’s work. However, since his students are working on similar problems, he is concerned about the appearance of a conflict of interest. In addition, he is not sure he wants to learn more about the work in question until he publishes his own work, to avoid later charges that he unfairly used some of the student’s ideas. Finally, there is the matter of yet another lost weekend doing the review, when his department chair has already told him to cut down on unpaid professional service.

Should Dr. L. agree to do the review?

If he is uncertain about his responsibilities, where can he get advice?

Would the situation be different if he had been asked to review the student’s work for an appointment or promotion decision?
Peer review can make or break professional careers and directly influence public policy. The fate of entire research programs, health initiatives, or environmental and safety regulations can rest on peer assessment of proposed or completed research projects. For peer review to work, it must be:

- timely,
- thorough,
- constructive,
- free from personal bias, and
- respectful of the need for confidentiality.

Researchers who serve as peer reviewers should be mindful of the public as well as the professional consequences of their evaluations and exercise special care when making these evaluations.

10a. Meeting deadlines

The effort researchers put into peer review is for the most part not compensated. Researchers may receive reimbursement for travel and per diem when they attend special grant-review sessions and occasionally are paid a basic daily stipend, but this seldom covers the true cost of reviewing a manuscript or a stack of grant applications. As uncompensated effort, the time researchers devote to peer review can easily take second place to other obligations. Running a crucial experiment or submitting a grant application on time understandably is more important than reviewing someone else’s work.

However pressed you are for time, if you agree to do a review, you should find the time to meet your obligation in a timely manner. Research is competitive. Researchers are rewarded for discoveries. They should not lose their priority for a discovery due to the tardiness of a reviewer sending comments on a manuscript. Research is also useful. The announcement of discoveries that can benefit the public should not be delayed because someone who agreed to review a manuscript does not have the time to do the review.

Editors, program managers, and others who rely on peer review to make decisions generally provide a deadline for getting the review done when they first contact reviewers. Anyone who agrees to take on a peer review assignment under these conditions should meet the proposed deadline. If the time frame is not reasonable, either decline to do the review or ask for more time in advance. Do not delay someone else’s work just because you are short on time.
10b. Assessing quality

Journal editors, grant administrators, and others rely on peers to assess the quality of proposed and published research. Some parts of an application or manuscript can be checked fairly easily. Are the calculations correct? Is the method that has been used or proposed appropriate? Do the reported results support the conclusions? Other parts are more difficult to confirm. Have the data been accurately recorded and reported? Were the experiments run? Did the subjects give consent? Do the articles cited in the references and bibliography contain the information they are said to contain?

Peers who are asked to make judgments about the quality of a proposed or completed project must do their best to determine whether the work they have been asked to review is internally consistent and conforms to the practices of their field of research. This certainly includes:

- assessing whether the research methods are appropriate;
- checking calculations and/or confirming the logic of important arguments;
- making sure the conclusions are supported by the evidence presented; and
- confirming that the relevant literature has been consulted and cited.

At the very least, peer reviewers should be expected to assess whether the manuscript or proposal under review makes sense and conforms to accepted practices, based on the information presented.

Research that conforms to accepted practices can still have problems. Research quality can be compromised by:

- careless mistakes made in reporting data and/or listing citations;
- the deliberate fabrication and falsification of data;
- improper use of material by others (plagiarism);
- inaccurate reporting of conflicts of interest, contributors/ authors; and
- the failure to mention important prior work, either by others or by the researcher submitting a paper for publication.

However, how much peer reviewers can or should do to detect these and other deceptive or sloppy practices remains subject to debate.

There are limits to the amount of checking that is both reasonable and practical. Unless given permission to do so, reviewers should not discuss the work they are reviewing with the authors. In many cases, reviews are “blind” (no author identification), so reviewers could not check with

Society for Neuroscience

Responsible Conduct Regarding Scientific Communication (1998)

2. Reviewers of Manuscripts

2.1. Thorough scientific review is in the interest of the scientific community.

2.2. A thorough review must include consideration of the ethical dimensions of a manuscript as well as its scientific merit.

2.3. All scientists are encouraged to participate if possible when asked to review a manuscript.

2.4. Anonymity of reviewers should be preserved unless otherwise stated in the guidelines for authors and for reviewers, or unless a reviewer requests disclosure.

2.5. Reviewers should be chosen for their high qualifications and objectivity regarding a particular manuscript.

2.6. Reviews should not contain harsh language or personal attacks.

2.7. Reviews should be prompt as well as thorough.

2.8. Reviewers must not use non-public information contained in a manuscript to advance their own research or financial interests.

2.9. Information contained in a manuscript under review is confidential and must not be shared with others.

http://web.sfn.org/content/AboutSfN1/Guidlines/guidelines.pdf
authors even if they wanted to. In addition, it is not reasonable to expect reviewers to check every reference and detail. The fact remains, however, that peer reviewers frequently miss problems that might have been detected had the reviewer checked a little more carefully.

If you agree to serve as a peer reviewer, remember that you have essentially been asked to provide your stamp of approval for someone else’s work. In such circumstances, it is wise to do your homework. Do not give your stamp of approval too easily.

### 10c. Judging importance

In addition to quality, peer reviewers are also asked to make judgments about the importance of proposed or published research. They are asked to answer questions such as:

- Assuming a researcher could carry out a proposed research project, is it important to do so?
- Are these research results important enough to publish?
- Has a researcher made important contributions to a field of study?
- Is this evidence important enough to be used in setting policy?

Along with quality, judgments about importance essentially determine which research is funded or published and which researchers are hired and relied upon for advice.

Peer reviewers do not always make judgments about importance with an open mind. Studies have shown that they can be swayed by:

- the stature of the researcher who conducted the research or the institution at which the research was conducted;
- country of origin;
- a preference for one research method over another, e.g., a clinical versus a laboratory approach; and
- the outcome of the studies under review.

For the most part, these factors should not have a bearing on judgments about importance and yet they do. Each has been shown to influence the judgments peer reviewers make about the publication of research results (see articles by Callaham, Cho, Dickersin, Godlee, Jadad, and Link, Additional Reading).

There is no simple solution to the problem of bias in peer review. Peers frequently are not of one mind about what is or is not important. One reviewer may feel that a field of research should move in one direction, a second in an entirely different direction. Often, it takes time and more research to find out whether a line of investigation or a particular set of findings is important. Nonetheless, researchers can take steps to lessen the impact of bias on their judgments and to help others judge for themselves whether a researcher has biases.

One way to lessen the impact of bias is to write transparent reviews. By “transparent” is meant laying out clearly for anyone reading the review how it was prepared, the literature that was used, and the reviewer’s own possible biases. If reviewers fully and carefully explain how their judgments about importance were made, others can assess whether they want to accept those judgments.

A second way that has been proposed to lessen the impact of bias is to eliminate anonymous reviews. Some argue that this would lessen the candor and rigor of reviews; others that it would make reviewers more accountable. For the present, most reviews are anonymous, which places the burden for fairness on the reviewer. If you have strong feelings about a person or particular line of investigation, tell the person who asked you to do the review and consider whether you can, in fact, provide an impartial assessment.
10d. Preserving confidentiality

Some information that is shared during peer review is shared confidentially, that is, with the understanding that it will not be shared with anyone else without permission. Confidentiality is generally required during:

✓ grant reviews,
✓ manuscript reviews, and
✓ personnel reviews.

During grant and manuscript reviews, confidentiality helps protect ideas before they are funded or published. In personnel reviews, confidentiality is important to protect personal privacy.

Peer reviewers have an obligation to preserve confidentiality during the review process if they have been asked to do so. While this obligation might seem obvious, it can be compromised in some seemingly harmless and other more harmful ways. For example, although researchers sometimes do, it is not acceptable to do any of the following without getting permission:

✓ ask students or anyone else to conduct a review you were asked to do;
✓ use an idea or information contained in a grant proposal or unpublished manuscript before it becomes publicly available;
✓ discuss grant proposals or manuscripts you are reviewing with colleagues in your department or at a professional meeting;
✓ retain a copy of the reviewed material (generally manuscripts and grant proposals should be shredded or returned after the review is complete); and
✓ discuss personnel and hiring decisions with colleagues who are not part of the review process.

There may be times when some added advice during a review may be helpful, but reviewers should not seek this advice without getting permission. It may also be tempting to use information in a grant application or manuscript to speed up your own research, but until it has been made public, confidential information is not available for use, even to reviewers. If you are not comfortable protecting confidential information, then do not agree to be a peer reviewer.

Researchers who are in a position to pass judgment on the work of colleagues have significant power. They can hasten or slow that work; credit or discredit it. They have the power to shape entire fields of research and to influence public policy. If you have that power, make sure you use it responsibly and with some compassion, knowing that what you say and do directly affects the careers of other researchers.

Questions for discussion

1. What should researchers or students do if a colleague or mentor asks them to take a look at a manuscript they have not been authorized to review?
2. What information contained in a manuscript or proposal should reviewers be expected to check?
3. Should peer review be anonymous?
4. How can researchers who sit on committees that advise on research directions separate their own interests from the best interests of the field they are helping shape?
5. What would happen if the public lost confidence in peer review and looked for other mechanisms to judge the quality and importance of research?
Resources

Policies, Reports, and Policy Statements


General Information Web Sites


Additional Reading