Peer Review: Integral to Science and Indispensable to *Annals*

> Despite its limitations, we need it. It is all we have, and it is hard to imagine how we could get along without it.
>
> –Arnold S. Relman (1)

Peer review was the "it" that Relman, then editor of the *New England Journal of Medicine*, referred to in this 1990 quote. Thirteen years later, the editors of *Annals of Internal Medicine* take the truth of Kelman's statement to be self-evident: We cannot imagine getting along without peer review. *Annals* maintains a database of approximately 10 000 potential reviewers. Of these, 1841 individuals reviewed at least 1 manuscript between 1 November 2002 and 15 October 2003. Two hundred seventy-five reviewers reviewed more than 1 manuscript, and 3 energetic reviewers reviewed 5 manuscripts each. In this issue of the journal, as we salute individuals who reviewed manuscripts for *Annals* over the past year, we reflect on the value, quality, and future of peer review.

The Value of Peer Review

Peer review has been a component of the scientific process for over 300 years (2), and scientists have probably been complaining about its shortcomings for nearly as long. Critics grumble about peer review's slowness, potential for bias and elitism, tendency to focus on trivial flaws while missing big ones, and inability to detect fraud (3–6). Fans extol it as an integral part of scientific process, essential to monitor and filter research, a constructive mechanism for improving the quality and presentation of research, and a motivation for authors to produce high-quality work. Several studies provide evidence that peer and editorial review help to improve the quality and readability of reports on medical research (7–10). However, others note that the true effects of peer review are uncertain (11, 12).

Reviewers clearly value peer review. Despite the lack of research to refute or confirm its benefits, reviewers spend time, a precious resource, on reviewing. Actual time spent varies from reviewer to reviewer, from article to article, and from journal to journal, but some research suggests that individuals who review for medical journals generally spend about 2 to 3 hours on a review (13–15). Many reviewers see peer review as a civic responsibility (2). They rely on others to review their own journal submissions, and a sense of duty to the academic community compels them to return the favor. Some reviewers take great pride in their connection to journals (16). While a few reviewers harbor dark motives, such as delaying publication of competitors' work or the opportunity to plagiarize (17), others claim that reviewing helps them to keep aware of what lies on the cutting edge. Frank Davidoff, previous editor of *Annals*, considered peer review an example of the many "gift" relationships that function in medicine (18). Davidoff pointed out that, ideally, authors submit the results of medical scholarship for publication as gifts to the research and clinical communities and to the public—not as commodities for sale. Reviewers who give their time to journals also offer a valued gift.

High-Quality Peer Review

While no universally accepted standards for high-quality peer review exist (19), some authors and editors characterize high-quality reviews as those that offer constructive and substantiated comments about the importance and originality of the research question, strengths and weaknesses of methods, presentation, and interpretation of results (20). We concur with these recommendations and believe that high-quality peer review depends both on perspective (who the reviewer is) and on content (what the reviewer says). In the **Table**, we suggest important questions related to perspective and content that reviewers can ask when deciding whether to review and before returning a review. We encourage reviewers to use this checklist to help improve their reviews.

Before agreeing to review, reviewers should consider whether they have expertise related to the methods or content of the paper that will make their views valuable. In the absence of expertise, can they offer a useful perspective? For example, while a generalist in clinical practice may not consider himself or herself an expert on the topic of a guideline, the clinician perspective may be valuable for the editors and authors. Next, reviewers should consider whether they have any potential conflicts of interest that might influence the objectivity of their critiques. Reviewers should decline the opportunity to review if clear conflicts preclude balanced judgment or if knowledge of the manuscript's content might lead to direct personal or financial gain for the reviewer. Reviewers who believe that they will not be able to keep confidential the information contained in the manuscript should refrain from reviewing it. If less clear conflicts exist, reviewers should discuss potential conflicts with the editors before they begin the review. Such conflicts do not always preclude review, but those that surface after the fact cause embarrassment for everyone involved. Last, reviewers should ask themselves, "Can I complete this review on time?" If timely completion is unlikely, please do the editors and the authors a huge favor and decline. The opportunity to review will certainly arise again.

The intent of the second set of questions in the **Table** is to help reviewers judge and improve the quality of their own reviews. Relevance to readers, importance, novelty, validity, generalizability, clarity, balanced presentations, and circumspect conclusions are the criteria at the core of *Annals*' editorial decisions, and we deeply value reviewers' opinions about these aspects of the work. Helpful reviews

point out the potential clinical, research, or policy implications of the results (or lack thereof). They say how the readership might use the article once published and put it in the context of previous work in the area. Good reviewers point out strengths in the conceptualization, design, and analysis of research. They note the limitations that threaten the soundness of conclusions and segregate major from minor flaws. They comment on the generalizability and applicability of the research. Skillful reviewers also comment on presentation. They point out whether the manuscript describes the work well enough for the target audience to understand it and whether the authors present methods in sufficient detail such that an interested reader could replicate the work if equipped with the proper resources. Reviewers can offer valuable insight about whether authors' conclusions adequately reflect or overreach findings.

The most skillful reviewers also pay attention to the format and tone of their reviews. They cite specifics to support criticisms. For example, if reviewers claim that a study is not novel, they cite the work that it replicates. If reviewers criticize the study population or recruitment methods, they say why the population or recruitment methods are problematic. Vague proclamations about study flaws help neither the editors nor the authors. Reviewers help authors most when they offer suggestions for improvement even when they do not think that the journal should publish the manuscript. The best reviewers avoid nitpicking. Comments on spelling and grammar—aside from those that actually compromise the scientific integrity of the article—aggravate authors who are hoping for substantive comments and waste valuable reviewer time. Finally, the best reviewers strive for a balanced tone; buttress criticisms with objective statements rather than exhortation; and write their reviews as if they were a knowledgeable, courteous colleague advising the authors.

Table. **Reviewer's Checklist**

Questions for reviewers to ask themselves when deciding whether to review
Expertise
Do I have expertise in the content or methods, or a valuable perspective on the issue?
Potential conflicts
Do I have conflicts of interest that preclude fair and balanced judgments?
Do I stand to gain, either financially or personally, from reviewing this particular manuscript?
Will I be able to hold the main information that I gain from reviewing this manuscript confidential until publication?
Ability to meet deadline
Do I have the time to devote to this review and complete it by the date the editors requested?
Questions for reviewers to ask before submitting a review
Content and scope of the review
Does the review address the relevance of the topic to readers?
Does the review address the manuscript's importance and novelty and say what it adds to existing knowledge?
Does the review address the validity of the research, pointing out major strengths and weaknesses of the methods?
Does the review address the clarity of presentation?
Does the review address important missing and/or inaccurate information?
Does the review address the generalizability of findings?
Does the review address the interpretation of results and stated conclusions?
Does the review address whether the authors noted and discussed important limitations?
Format and tone of the review
Does the review cite specifics to support criticisms?
Does the review offer suggestions for improvement?
Does the review keep nitpicking to a minimum?
Is the review's tone balanced?
Did I declare potential conflicts of interest?

The Future of Peer Review

The recent push for open access to electronic journals in biology and medicine has intensified existing skepticism about the value of the peer-review process (21). Some believe that a system that permits researchers to post their work without prepublication peer review for subsequent comment by anyone who wanted to comment would be preferable to the existing system of closed-access, peer-reviewed journals. While this model has become the norm in the physical sciences, it would be a seismic shift in the clinical sciences. In fact, forces interested in changing the status quo in biomedical publishing have moved away from models where vetting takes place after publication to models, such as BioMed Central (www.biomedcentral.com) and the Public Library of Science (www.plos.org), that maintain prepublication peer review.

As editors, we are loath to abandon the current peer-review process for one with less rigorous (or no) prepublication peer review. While we welcome better definition of the purposes of peer review and agree with calls for more research about peer review (22), we witness daily the benefits of peer review in helping to inform editorial decisions and improve manuscripts. Granted, not all reviews are useful. Some are sloppy, ill-conceived, petty, biased, or inaccurate. However, in our experience, most reviews tell us something about an article that we would have missed without the review and lead to improved analysis, presentation, or interpretation of research. We predict that, despite its imperfections, peer review will remain an essential part of clinical research.

Fortunately, the future holds good news about an additional reason for peer reviewers to review. The American Medical Association recently approved the granting of continuing medical education credits to peer reviewers. We hope that the specifics of this tangible reward for reviewers' contributions will be in place a year from now when we thank our 2004 reviewers. Individuals interested in joining *Annals*' loyal volunteer force of reviewers should contact Robert Blackwell, overseer of our reviewer database, at rblackwell@acponline.org. We are tremendously grateful to the individuals who perform this valuable, volunteer service for the journal. We cannot imagine carrying on our work without our reviewers.

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