

◆ Acceptance Address: Good Reporting— An Essential Component of Good Science

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The phone call I received to tell me of this award was certainly a very big surprise. I am extremely proud to have been honored in this way by the Council of Science Editors. It is particularly pleasing to receive an award from outside one's own professional circle. And it is a tremendous pleasure to be here in Austin to receive this award personally.

An Unintended Journey

Academic researchers are expected to be knowledgeable about, if not expert in, many activities in which they have had little or, frequently, no training. Obvious examples include giving talks, writing papers, reviewing for journals, and even managing a department. On the scientific side, too, many drift into fields that they could never have predicted and that seemingly have little direct relevance to their chosen career. As a medical statistician, I could never have imagined that so much of my work would be related to efforts to try to improve the quality of medical research, both as done and as reported. (But it hasn't really helped me much when I am asked, "What do you do?")

In the 1970s, I worked in a research department where we had coffee and lunch in the department library. Many current medical and epidemiologic journals were on open display, and in those breaks we spent a lot of time poring over the journals. (It's an old joke.) I recall especially many discussions with my colleague and fellow statistician Martin Bland. We were surprised to discover that even in the best journals, research articles frequently

seemed to use incorrect statistical methods. We also recognized that many journal articles were hard to judge because they did not explain fully what had been done.

Martin and I wrote a letter to *The Lancet* criticizing one piece of ambiguous writing. We complained that the report of a controlled trial said that patients were allocated to treatment "more or less randomly". Our letter (see box) was rejected even though it was only 80 words long! Perhaps surprisingly, we appealed this decision, submitting a revised (and longer) letter in which we said that it made as much sense to say that treatment allocation was more or less random as to say that a patient was more or less dead. This analogy did not lead to an editorial change of heart, but we soon had a letter published in *The Lancet* about another article. Incidentally, the editor suggested that we take up our concern with the authors. We wrote to the authors, who did not reply. Soon after this, I wrote my first article in which I discussed methodologic errors in medical research.¹

It is clear now that several of my main concerns in recent years had their seeds in those early events. As noted, these include concern about errors in methodology and recognition of the importance of good reporting but also concerns about the way that journals handle letters to the editor.²

As a statistician working in medical research, I have the broad goals of helping medical researchers to do useful research and developing ways to do better research. A keen interest in how research is reported in journal articles is a key component, as reflected in my increasing time spent in the development of several reporting guidelines. Although the following observations are based mainly on my experiences in medicine, the general principles apply to all research fields.

What Is the Purpose of Medical Research?

I have commented previously on the purpose of medical research:²

The aim of medical research is to advance scientific knowledge and hence—directly or indirectly—lead to improvements in the treatment and prevention of disease. Each research project should follow on systematically from previous research and should feed into future research. Each project should contribute beneficially to a slowly evolving body of research. A study should not mislead; otherwise it could adversely affect both clinical practice and future research.

Two linked problems with published research should concern all of us. First, research may be methodologically unsound through use of inappropriate methods, in design or analysis, or faulty interpretation. In medical research, there is a wealth of evidence that such problems are common.³ (I do not believe that medicine differs in this respect from other fields except by having been studied more often; empirical evidence is scarcer in other fields.) Poor methodology includes using a study design that fails to address the question or does so in a biased way, using incorrect methods of analysis, misusing correct methods, and misinterpreting results.³ These mistakes may arise through ignorance, but that is a highly questionable defense.⁴ The second problem is that research is often reported badly, so we cannot know exactly how the research was done. These two concerns are linked in that poor reporting may mask poor methodology. This was the gist of our letter in 1975, and it remains a major concern now. The need for good reporting was neatly summarized by

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Acceptance address continued

Frank Davidoff:⁵

Accurate, transparent reporting is like turning the light on before you clean up a room: It doesn't clean it for you, but does tell you where the problems are.

An additional issue, of increasing concern, is the selective reporting of research. Evidence is accumulating of widespread problems arising from the nonpublication of studies because of their results (usually statistically nonsignificant) and the selective reporting of results within published articles, again generally in relation to statistical significance. Such practices demean the literature and mean that research findings that get published give a biased representation of what was done and what was found. Those problems are mainly the fault of researchers, but editorial aversion to statistically nonsignificant results also contributes.

We Need Research Literature We Can Rely On

Assessment of the reliability of published articles is seriously impeded by inadequate reporting. We know that not all studies are done well, and we know that some aspects of trial conduct seriously harm the reliability of the findings. If we cannot discover from a publication exactly how a study was done, then we are left to speculate. We should not have to assume that particular things were done, or done well, in the absence of explicit information to that effect.

For all types of research, readers require clear details of what was done in order to evaluate the reliability of findings. It must be recognized that good reporting is a mandatory component of good science, not an optional extra:

Good scientific practice embraces all the procedures and practices that are necessary for planning, conducting and reporting research and scholarship within a framework of scientific integrity. By providing a common currency, good practice facilitates the vital,

Unpublished letter to *The Lancet*

The Editor,
The Lancet,
7 Adam Street,
Adolph, London, WC2N 6AD.

11th February, 1975

Sir,

Randomness

The paper by Dr. Clarke and Dr. Campbell (Feb. 1, p. 246) describes how 201 people were allocated to two groups "more or less randomly". We would prefer that allocation be either random or it is not - there is no intermediate state. Mostly random is not random (see for example the paper by Student¹ about the remarkable milk experiment).

It is to be hoped that this is a lapse in expression and not in method!

D.G. ALTMAN,
J.M. BLAND.

1. "Student", *Biometrika*, **23**, 398, 1931.

external processes of peer review, verification and repeatability. This enables other scientists to judge the validity of new contributions to knowledge and understanding.⁶

Thus, one of the responsibilities of editors is to ensure that the necessary information is included in published articles. This important idea is echoed in a recent CSE white paper, "Promoting Integrity in Scientific Journal Publications".⁷ The section on editor responsibilities to readers includes (my emphasis)

evaluating all manuscripts considered for publication *to make certain that each manuscript provides the evidence readers need to evaluate the authors' conclusions* and that authors' conclusions reflect the evidence provided in the manuscript.

These sentiments are very fine, but what evidence is there that this happens, and what efforts are made to ensure that it happens?

There is in fact a huge amount of published evidence that, in the medical arena at least, deficient reporting of research is common. It is clear that despite the best efforts of peer reviewers and editors, journals as a whole are not living up to the CSE policy quoted above, notably the passage emphasized. There is thus a gap between the research done and what is reported.

Reporting Guidelines

Journals can guide authors with their "instructions for authors". Guidelines can help to bridge the gap between research done and what is reported.

Our review of instructions for 166 high-impact journals in 2003, however, found

that “instructions provide little guidance about methodologic and statistical issues, and the advice provided is often contradictory among journals.”⁸ This finding may not be so bad, however. Rather than have each journal trying to develop its own guidance, it would be much better for them to tap into consensus guidelines developed by groups of experts so that advice on reporting research methods and findings is consistent among journals.

Reporting guidelines have become more common and prominent in the last 10 years. Best known is the CONSORT statement (www.consort-statement.org)—recommendations for reports of randomized controlled trials—but there are also guidelines for other study designs, such as systematic reviews (QUOROM) and diagnostic accuracy studies (STARD). CONSORT in particular and other guidelines to a smaller extent have received strong support from the leading general medical journals (in their development, publication, and implementation). However, overall reporting guidelines have not been implemented on a wide scale and therefore had a limited impact on the wider medical literature. Less than one-fourth of high-impact journals mentioned CONSORT in their guidance in 2003, and several of those did so in somewhat ambiguous language.⁹ There are encouraging signs of the development of reporting guidelines in other fields, including education and software engineering.

The EQUATOR Initiative

Reporting guidelines can lead to important improvements in the quality and reliability of published research. Although they have had some demonstrable benefits, their potential impact on the quality of

research-based knowledge is not currently being fully realized. Also, the development of reporting guidelines is a difficult and undervalued activity.

We have set up the EQUATOR (Enhancing the QUALity and Transparency Of health Research) Network with the goal of improving the quality of health care by promoting the transparent and accurate reporting of health research. The EQUATOR Network aims to develop into a global organization covering all fields of health research and all nations and actively involving multiple key stakeholders. Its Web site (www.nks.nhs.uk/equator.asp) will provide resources for researchers, peer reviewers, and editors. We plan to develop both online and face-to-face courses related to reporting research and the use of reporting guidelines, and we will monitor progress in the improvement of health-research reporting. We look forward to interacting with your journals in the future and look forward to support from CSE members. The deficiencies of the scientific literature are global, and they need a global solution. This is impossible to achieve without broad financial support. Among different organizations that we hope will contribute are journal publishers. It is difficult to imagine that they would not support an initiative that improves the quality of the “goods” they are selling and that will facilitate the work of the editors and peer reviewers they employ.

As my remarks indicate, progress is best achieved with collaboration and consensus among multiple groups. My own activities have been largely collaborative with numerous colleagues, of whom I wish to mention in particular David Moher and Ken Schulz, colleagues in CONSORT.

Again, I am very honored to receive this award, which, apart from personal recognition, is explicit support for the importance of activities designed to enhance the reporting of research. 🙏

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