MEDICAL EDUCATION

Reviewing scientific papers

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This is the fourth article in a series on medical education.

A recent informal review by the editors of this journal showed that on a scale of 0 to 5 the quality of 25% of referees' reports scored 2 or less. Little training is given in this country in how to review a scientific paper and, apart from how to judge trial design and data analysis,[1] there is little help in the literature. The late Julius Comroe held seminars in the subject (personal communication). Fellows who attended were expected to have read all the references in the paper he had given them to review. Otherwise they were asked to leave! These doctors received formal training in all the aspects of critical appraisal of a scientific paper, something which perhaps should be encouraged for higher trainees in this country.

Background

SHOULD REVIEWERS BE EXPERTS?

There are few rigorous studies of the quality of referees' reports but in one of these it appeared that expert reviewers agree extremely poorly.[2] The more expert the reviewer the less time was spent on the review, the poorer was its quality, and opinions of papers before reading them were held more strongly. Experts were less likely to agree than non-experts in areas such as methodological rigour and, in another study, conclusions drawn from the data.[3] However, expert opinion *is* needed to judge method. A good reviewer should know that since this area appears to be contentious s/he should allow for debate.

Rarely a paper is outstandingly good or bad so that an editorial decision can be made without review. For one journal, peer reviewers were judged on thoroughness, fairness, helpfulness, courtesy, and knowledge of the manuscript's subject.[4] Those who scored well were young, from strong academic institutions, were well known to the editors, and had been blinded to the identity of the manuscript's authors.

ANONYMITY

This has some support.[5] It would be interesting to know whether, in this country, reviewers could identify the source of a report, not just by the content, which they may well have heard at a national meeting, but also by the style.

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How to review a paper

TIMELINESS

Editors remember unnecessary delays. Honesty about competence to review a paper within the time limit is appreciated by everybody.

BIAS

If the reviewer is aware that s/he could be biased – for whatever reason – then the manuscript should be returned. Bias could explain the disagreement between experts already mentioned. Institutions working on the same topic are hardly likely to provide unbiased reviewers of each others' work. There is some suggestion that a competent reviewer in a non-competing field is more likely to provide a good quality review.[6]

STRUCTURED REVIEWS

The following guide sets out some of the requirements of a good paper. Reviewers who are new to the task may find this helpful and compose checklists of their own. The guide is not comprehensive and the final report will undoubtedly reflect the reviewer's own particular style.

Introduction

Is the question being asked relevant? For example, is it clear why it is important to know the incidence or epidemiological characteristics of a condition or undertake a scientific study? This may be a matter of opinion and even although the study has been undertaken rigorously the topic may not be of sufficient importance to be accepted for that particular journal. The editors will make the final decision.

Has the background been fully reviewed? If in the opinion of the reviewer key papers have not been referenced then it is helpful for the authors to know which these are. Is it clear how the background informs the hypothesis or purpose of the study? A reader who is not an expert should understand the link. The hypothesis or purpose of the study should be clearly set out.

Methods

In this section editors rely on an expert opinion. Are definitions unambiguous? In the description of the study design is it clear what data are to be collected, how, and why? Is the sample representative? Have the controls been correctly selected, proper randomisation

procedures followed etc? The checklist used by the *British Medical Journal* is a helpful reference.[1]

If a change is an endpoint, is its size an important one and was the number of subjects or measurements to detect this change calculated before the study was undertaken? Are the inclusion and exclusion criteria clearly defined?

Is the method for data analysis the correct one?

Authors may choose to explain their methods either in this section or elsewhere in the paper. They may only reference methods that have been described in a previously published report. The reviewer should decide whether these need to be described again or whether they are well enough known not to need further explanation and whether the methods selected are correct for the task. Is it appropriate to describe details such as calibration of instruments, reproducibility of measurement, or interobserver variability?

Results

Can the raw data be presented graphically? The statistical analysis can only really be judged if the data are presented. For large studies this may not be possible. Do points on figures correspond to numbers in text?

Is the data analysis in accordance with what was promised in the methods section? Are the data presented correctly, for example, confidence intervals instead of standard errors? The reviewer might like to suggest how they could be presented better. If the data have been examined in ways not planned is this defended?

Discussion

Are the results discussed in relation to the hypothesis? Are the limitations of the study – methods and results – clearly defined? This is a guard against overinterpretation. Are the results discussed in context with relevant literature? Are they overinterpreted or inappropriately extrapolated and are comparisons with previous results valid?

References

Are these complete? Are there secondary references? In a scientific paper these should be discouraged.

Title and abstract

Sometimes titles and abstracts are totally misleading. For example the title 'Drug X is good for condition Y' does not properly represent a study where only a tiny benefit has been demonstrated. The title may be all a reader notices. Whether the abstract is structured or not it should be an accurate reflection of the paper and in particular the conclusion should not be an overinterpretation of the results. A description of the study invites readers to examine the evidence presented and form their own conclusions.

Presentation

A paper's presentation can sometimes prejudice the authors. English may not be the first author's language – few English speaking referees could write a scientific paper in another language. Typographical errors should only be noted. Time spent on these details could be better spent on the scientific content as journals' subeditors supervise these aspects.

ASSESSMENT OF REVIEWER'S REPORT

A scientific review is not just a guide for editors but will be studied carefully by the authors. Reports which are sarcastic and dismissive can demoralise a young research worker and can anger and frustrate a senior author.

Good referees' reports should ideally have some structure, should be helpful, fair, and have a balance of positive and negative comments about how the study or presentation could be improved. A summary should mention why the study or observation is or is not important and relevant to the field. It should also include a comment about whether the study satisfactorily answered the question asked.

Summary

Guidelines for the preparation of structured reports for laboratory studies, clinical studies, epidemiological studies, and observations could be useful. A structured report should prompt reviewers to acknowledge familiarity or otherwise with method, background papers, and so on. New reviewers could draw up their own system. Reports should be helpful and courteous so that whether or not the paper is accepted for publication the authors have a chance to improve it.

1 Gardner MJ, Altman DG. *Statistics with confidence.* London: BMJ Publishing Group, 1989.
2 Oxman AD, Guyatt GH. The science of reviewing research. *Ann NY Acad Sci* 1993; **703:** 125–33.
3 Scharschmidt BF, DeAmicis A, Bacchetti P, Held MJ. Chance, concurrence and clustering: analysis of reviewers' recommendations on 10 000 submissions to the Journal of Clinical Investigation. *J Clin Invest* 1994; **93:** 1877–80.
4 Evans AT, McNutt RA, Fletcher SW, *et al.* The characteristics of peer reviewers who produce good-quality reviews. *J Gen Intern Med* 1993; **8:** 422–8.
5 Colonna G, Ragone R. Referee bias. *Nature* 1994; **367:** 108.
6 Baue AE. Reflections of a former editor. *Arch Surg* 1993; **128:** 1305–31.