



Review Article

Peer review in medical journals: Beyond quality of reports towards transparency and public scrutiny of the process

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ABSTRACT

Published medical research influences health care providers and policy makers, guides patient management, and is based on the peer review process. Peer review should prevent publication of unreliable data and improve study reporting, but there is little evidence that these aims are fully achieved. In the blinded systems, authors and readers do not know the reviewers' identity. Moreover, the reviewers' reports are not made available to readers. Anonymous peer review poses an ethical imbalance toward authors, who are judged by masked referees, and to the medical community and society at large, in case patients suffer the consequences of acceptance of flawed manuscripts or erroneous rejection of important findings. Some general medical journals have adopted an open process, require reviewers to sign their reports, and links online pre-publication histories to accepted articles. This system increases editors' and reviewers' accountability and allows public scrutiny, consenting readers understand on which basis were decisions taken and by whom. Moreover, this gives credit to reviewers for their apparently thankless job, as online availability of signed and scored reports may contribute to researchers' academic curricula. However, the transition from the blind to the open system could pose problems to journals. Reviewers may be more difficult to find, and publishers or medical societies could resist changes that may affect editorial costs and journals' revenues. Nonetheless, also considering the risk of competing interests in the medical field, general and major specialty journals could consider testing the effects of open review on manuscripts regarding studies that may influence clinical practice.

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1. Introduction. Peer review: The base of evidence-based medicine

Medical journals disseminate scientific information that helps in understanding, preventing, and treating diseases. Editors decide which data will be available to the medical community and to patients also based on reports of experts in the field who, acting as consultants, verify if research findings meet the necessary standards. Although editors retain the authority and responsibility to override reviewers' recommendations regarding the final disposition of manuscripts, reviewers appear to be influential, and it has been reported that in two top-tier specialty journals a recommendation for rejection or acceptance was eventually accompanied by, respectively, 93% rejection and 67% acceptance rates

[1]. Therefore, peer reviewers play a crucial role in the selection of those studies that, once published, will inform health care decisions.

Through the years, the peer review system has undergone increasing enquiry and criticisms, mainly due to the possibility of bias, conscious or unintentional (see, as reviews on the different types of bias, [2–4]) and the considerable effects they can have on the scientific literature that will eventually inform health care decisions [5]. Moreover, when the peer review process fails, there are additional negative consequences, as scientists who got published without deserving it, or scientists who got rejected despite deserving to be published, respectively gain or lose credits incorrectly, and this has an indirect impact on reputation and grants. This causes distortions in the mechanisms through which science self-regulate itself also in terms of resource allocation, and has an indirect effect on the value of knowledge produced by the system.

Modifications of the process have been studied with the goal of improving the quality of reviewers' evaluations and, consequently, that of reports of biomedical studies and of the evidence offered to health care providers, policy makers, and consumers [2,3,6–8]. In particular, some medical journals have adopted an open peer review system, thus revealing the reviewers' identity to authors [9], whereas reviewers are usually kept anonymous (blind or closed peer review). Given the

Abbreviations: COI, Conflicts of interest; DOI, Digital object identifiers; ORCID, Open researcher and contributor ID.

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critical importance of peer review and the potential effect of any editorial decision, recommendations have been made to assess the feasibility of a transition from the blind to the open system also within specialty journals [10,11]. Some advantages and disadvantages of open versus blind pre-publication peer review are here examined.

2. Methods

The best quality evidence was selected with preference given to the most recent and definitive original articles and reviews. Information was identified by searches of MEDLINE and references from relevant articles, using combinations of MESH terms “peer review,” “blind peer review,” “open peer review,” “medical publishing,” and “conflict of interest.” The search was limited to peer-reviewed, full-text articles in the English language. Papers published in the last 20 years were considered. Open pre-publication review (e.g., as adopted by PeerJ) and post-publication review (e.g., as adopted by F1000Research) will not be addressed owing to lack of adequate evaluation in the medical field.

3. Blind peer review: The dark side of science?

In theory, single-blind peer review (reviewers know the authors' identity whereas reviewers are kept anonymous to authors) should allow unconditional judgments without concerns regarding potential consequences on one's career and personal relationships [12]. This system would protect especially young researchers assessing manuscripts submitted by senior or academically powerful investigators [13]. However, this closed model is not immune from systematic bias, as reviewers may not limit themselves to an objective evaluation of research methodology and findings' validity but may interpret the study according to personal convictions or friendship/enmity with authors [9,14]. This may occur frequently in subspecialty fields, where most experts know each other well. The possibility for authors to suggest/exclude reviewers could hypothetically further complicate the issue, but no differences in quality of reports were observed when reviewers were suggested by authors or by editors [15].

To prevent bias, double-blind peer review (reviewers and authors do not know each other's identity) has been studied or implemented by some general and specialty journals [16–18]. Nonetheless, interested authors can make themselves easily recognizable [19]. Therefore, to achieve adequate blinding, the entire manuscript should be accurately de-identified before sending it out for review, thus imposing a burdensome and costly extra-work to editorial offices. In spite of these efforts, reviewers are still able to identify authors in up to 40% of instances [20]. Independently of the preference expressed by both authors and reviewers, [21] double-blind peer review was not associated with better quality reports compared with single-blind peer review [22–24]. In particular, neither blinding reviewers to authors' identity and provenience of the manuscript, nor asking them to sign their reports, improved the errors' detection rate [17]. Moreover, knowledge of authors and origin of data might be considered important [3].

Finally, neither system prevents the risk of intellectual plagiarism, attempts at delaying manuscript publication, or the influence of financial conflicts of interest (COI). Reviewers must disclose COIs, but it is not always clear if this leads to their exclusion in case of relevant financial ties. For a subspecialty or small journal, finding competent and available reviewers already may be difficult, and selecting only those without financial and non-financial COIs might be impracticable.

4. Pros and cons of open pre-publication peer review

Junior reviewers who have to sign reports on manuscripts written by powerful academicians may refrain from negative judgments because of fear of unfavorable consequences on their career [13]. Senior peers may fear revenges in case of future reversal of roles in manuscript evaluation

[12]. Conversely, a sort of reciprocal favoritism may ensue, with a “credit” to be cashed when the reviewer will in turn submit a manuscript indicating the author's name among the suggested reviewers. In other words, once everything is public, scientists could even rationally start to game the system. For instance, considering peer review as a cooperation dilemma, scientists can reciprocate favorable reviews to known reviewers who previously ensured positive reviews to them, and sanction those ones who did not. This can increase evaluation bias [25]. As mentioned before, this may happen also with reviewers' recommendations. However, the fact that studies did not fully capture this effect is due to sample bias, as scientists could play sophisticated reciprocity strategies across different journals, and this is hardly empirically traceable through data on single journals. The above risks may be higher in a specialty field where experts in specific areas of research are limited. Moreover, specialty journals may face increasing difficulties in finding available reviewers [26]. According to Khan [13], one expert out of four already declines the invitation to review by a specialty journal adopting the single-blind system, but this percentage could increase up to 40% in case of open review. In addition to inconveniences for the editorial office, excessive reviewers' self-selection may lead to a further systematic (and undetectable) bias.

In short, there could be a trade-off between full transparency and quality of the process. According to its detractors, open review may thus result in worse reports compared to blind review, but this has not been observed in randomized, controlled trials [10,11,27]. Noteworthy, a similar study conducted by a specialty journal observed a small difference in the quality of reports in favor of open reviewers [28]. This lack of major differences has been ascribed to the Hawthorne effect, as reviewers allocated to both signed and unsigned groups could have performed better than usual just because they knew they were participating in a trial [10,28]. However, no such effect was apparent when a group of anonymous reviewers unaware they have been recruited in a study was included [27]. A slight improvement in the quality of reviewers' reports has been observed also in a recent retrospective study comparing open and single-blind peer review in two very similar specialty journals [29]. Moreover, reports of inappropriate or rancorous authors' reactions following an unfavorable open review are exceedingly rare [11], although unblinding reviewers in specialty/subspecialty journals may reveal less safe compared with large general medicine journals.

Proponents of open review maintain that masking reviewers identity generates an ethical imbalance, as it is improper to undergo an evaluation by anonymous judges when they know who the “defendants” are [10]. Because a completely closed system (with only an editorial assistant knowing the authors' identity and only the editor knowing the reviewers' identity) is impractical, open peer review would be the only ethically sound option [30]. Open review has been already adopted not only by general medical journals such as the *BMJ*, *BMJ Open*, and the *Journal of the Royal Society of Medicine*, but also by specialty journals, including those within the BMC series.

In addition to requesting reviewers to sign their reports, some journals now make the entire pre-publication history of accepted manuscripts available online [31]. Thus, the scientific community, and not only authors, may read the reviewers' and editors' comments, the authors' response and the original and revised versions of the manuscript. The advantages of such a policy are multiple and include accountability of reviewers. Owing to reputational costs, the risk of favorable judgments of methodologically flawed studied or provision of shallow reviews should be reduced [32]. Reviewers' reports could be publicly evaluable in order to verify if methodological shortcomings were correctly identified and if the suggested modifications were appropriate or unwise. Moreover, posting of pre-publication histories increases also editors' accountability for their choice of reviewers, and decisions regarding manuscripts [6,30,32].

Peer reviewing papers is one of the scientists' most important tasks, for which they are not paid and rarely get credit. An open review system

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