Special article

The peer-review process of the *Journal of Neurosurgery*

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Peer review is the process by which scientific articles are evaluated and selected for publication. To clarify this procedure for readers and writers, the authors present a detailed description of peer review at the *Journal of Neurosurgery (JNS)* in the context of other journals. They discuss the unique characteristics of *JNS*’s peer-review process and how it contributes to the quality of the *JNS*.

**KEY WORDS** • *Journal of Neurosurgery* • peer review • neurosurgical history

Many authors may be unaware of how their manuscripts are evaluated after submission to a journal. What happens between submission and publication? How do the anonymous reviewers choose which papers to publish and is this selection process fair? Does this procedure promote the highest quality publications? To make peer review less mysterious, we examined the process at the *Journal of Neurosurgery (JNS)*. The peer-review process at *JNS* is of particular interest because some of its key elements are unique among scientific journals.

In addition to the goal of disseminating information about peer review for authors and readers, a secondary goal of this report is introspection. Our discussion contributes to a larger, worldwide movement to examine the biomedical peer-review process from within. More than 300 representatives of 46 countries met at the 1997 International Congress on Biomedical Peer Review to discuss research findings on the subject. Reflecting on this conference, one author commented that research on peer review is “...an embryonic field of study that has gained momentum during the last dozen years. ...”15 This report adds to the momentum.

**Vital Statistics**

The *JNS* is a monthly publication with a total paid circulation of 11,969. It received 1120 manuscript submissions in 1997 and ultimately accepted 28% of these manuscripts. Approximately 1% of the accepted manuscripts did not require revision. Each issue contains between 25 and 34 articles. The average time from manuscript submission to the initial decision concerning publication is 6 to 8 weeks. The publication process is becoming increasingly more efficient, presently requiring an average of 4 to 5 months from acceptance to publication. The impact factor of *JNS* for 1996 (the average number of times articles from 1994 and 1995 were referenced during 1996) was 2.77, making it the most widely referenced neurosurgical journal.9 In addition, the *JNS*’s impact factor ranked sixth of 107 surgical journals and 40th of 144 neuroscience journals.

This journal has a strong global presence. In 1997, *JNS* had subscribers in more than 45 countries, the greatest number of whom reside in the United States, Japan, Korea, Germany, Italy, and Canada (Fig. 1). Manuscript submissions originated from more than 36 countries in 1997. The greatest number of manuscripts were received from the United States, Japan, Germany, Canada, France, and Italy (Fig. 2). Submissions from outside North America are always encouraged by the editor.

To keep published material not only relevant to clinical practice, but also innovative and scientific, the *JNS* maintains a balance among the types of articles accepted for publication.
publication: clinical studies, laboratory investigations, case reports, technical notes, case illustrations, and historical vignettes (Fig. 3). Although not subjected to the same peer-review process, JNS also publishes book reviews, letters to the editor, and announcements. To represent all aspects of neurosurgery, JNS also seeks to publish manuscripts related to a variety of neurological specialties. In 1997, the number of articles published in JNS roughly corresponded to their relative importance to clinical presentation and basic neurological research (Fig. 4).

Peer-Review Process at JNS

Initial Evaluation

Once a paper is received at JNS, it undergoes a preliminary review by an administrative assistant. The manuscript is checked for compliance with JNS’s format, including such technical details as the correct listing of references and labeling of figures. If no errors requiring correction by the authors are found, the manuscript is assigned a number and forwarded to the editor, John A. Jane, Sr., M.D., Ph.D. The editor first decides which of the aforementioned categories is appropriate for the paper and assigns the manuscript to appropriate reviewers.

Editorial Board

The reviewers are primarily members of the editorial board. The editor presides over this board, which consists of 12 reviewers and one or two chairmen (Fig. 5). With the exception of two Canadian neurosurgeons, the board is composed of neurosurgeons from the United States. New members are elected by the board and generally serve a 7- to 12-year term. An editorial board member becomes chairman during the last year of his tenure. During the period 1997 to 1999 there are two cochairmen, a first in the history of JNS.

The editorial board has traditionally been a small group.
The first editorial board, formed in 1944, consisted of five members. Before the rapid growth in the number of manuscript submissions, each member was responsible for reviewing every manuscript. Today, of course, it is impossible to uphold this founding ideal, but the editorial board deliberately remains small and busy, in the spirit of the first editors. The editor and chairmen still personally review every manuscript submitted to the JNS.

Manuscript Review Process

The editor decides which board members will review each manuscript submitted to JNS. This decision is loosely based on the subspecialty interests of the individual reviewers, any potential conflicts of interest, and their recent editorial workload. These assignments are accurately recorded. Each manuscript is evaluated by at least two reviewers as well as one chairman, in the following sequence (summarized in Fig. 6).

The “primary” reviewer produces a written review and sends both the manuscript and his review directly to the “secondary” reviewer. (For every manuscript, an “alternate” reviewer is also assigned, who reviews the paper if either of the first two reviewers is unavailable.) The secondary reviewer has the benefit of reading the first reviewer’s comments before making his own evaluation, if he chooses. If the secondary reviewer agrees with the primary reviewer, he sends the manuscript and the reviews directly to the chairman. If the secondary reviewer disagrees with the first reviewer, he sends the manuscript and the reviews to an “arbitrator,” who reviews the paper to break the tie and then forwards the whole package to the chairman. The chairman benefits from reading all prior reviews before compiling his own comments.

After the final decision letter has been signed by the editor, copies of both the letter and a compilation of all reviews are circulated to the entire editorial board.

Outside Reviewers

In addition to being reviewed by the editorial board in the standard fashion, approximately 40% of all manuscripts are also sent to reviewers who are not members of the board. These “outside” reviewers are chosen either at the beginning of the process by the editor or later during the process at the discretion of members of the editorial board. The JNS does not keep a fixed list of reviewers from which to choose. Any qualified expert can be chosen as an outside reviewer, including neurosurgical or other residents. On rare occasions authors may request specific outside reviewers, especially if the subject matter is highly specialized within the basic sciences. The editor attempts to honor these requests whenever possible.

Manuscript Grading Process

For each manuscript, reviewers provide both comments and numerical scores. A separate score is given for each of the following categories: scientific merit, neurosurgical significance, and reader interest. The scores collected from the reviewers are averaged into a single number—the “published grade.” The possible scores consist of 1 (must accept), 2 (should accept), 3 (may accept), 4 (reject), or anywhere in between (2.3, for example). Both the reviewers’ comments and scores are used to decide whether a paper should be accepted. Selected comments are compiled at the end of the review process by the editor and sent to the corresponding author of the manuscript. The identity of the reviewers and the actual manuscript...
scores are not revealed to the authors. The authors are either informed of rejection or asked to revise the paper (only 1% of papers are accepted without revision). If the paper is revised to the satisfaction of the editor and the reviewers, there is a high likelihood that it eventually will be accepted.

Although the editor retains the ultimate authority over what is published, he rarely acts against the recommendations of the reviewers. If his opinion differs from those of the board, he may request additional reviewers to examine the manuscript in question. Although the editor does have the authority to reject submissions without an initial review by the board, an action practiced by many larger journals, he feels that all submissions deserve review by the board members. Even if a paper is rejected, the reviewers’ comments may help the author to improve the manuscript, which may lead to its eventual acceptance in a different publication, or as a resubmission to JNS.

A Comparison of the Peer-Review Process at JNS and Other Journals

How does the peer-review process of JNS compare with those practiced by other journals? We surveyed the managing editors of 14 other major scientific and biomedical journals, both general and specialty related (Table 1). We found that certain aspects of the peer-review process are standard among scientific journals: reviewers are chosen from the same field as the author or from one closely related; reviewers are experts in their fields; more than one reviewer evaluates each manuscript; and an editor or editor-in-chief presides over the review process and has final authority over manuscript selection. Apart from these basic similarities, however, the process varies among journals.

The JNS does not blind its reviewers to the identity of the authors, but it does blind the authors to the identity of the reviewers. In comparison to other journals, these practices are not unusual (Table 1). However, the JNS does have an unusually small number of reviewers and sends a comparatively small number of manuscripts to outside reviewers. Because all manuscripts are reviewed by members of the small editorial board, each reviewer evaluates a large number of manuscripts per year. In 1997, each reviewer evaluated an average of 227 manuscripts, compared with less than 20 manuscripts per reviewer at most other journals surveyed. This average excludes the two chairmen, who reviewed an even greater number of manuscripts.

In addition to the use of a small, experienced editorial board, another aspect of JNS’s peer-review process is, to our knowledge, not only unusual, but unique. Reviewers at JNS are not blinded to each other’s opinions during the review process. None of the other journals presented in Table 1 practice this variant of peer review, and none of the editors we interviewed knew of any other journal that follows this practice.

Thus JNS practices a “serial” review process rather than the standard “parallel” process. In the parallel process, all reviewers are sent separate copies of the manuscript at the same time and are blinded to each other’s opinions during the decision-making phase. After decisions regarding publication have been made, it is common for editors to circulate all of the reviewers’ comments.

A Critique of the JNS’s Peer-Review Process

The peer-review process continues to stimulate interest and controversy in the scientific community. The Journal of the American Medical Association has devoted two entire issues to peer review (July 13, 1994, and July 15, 1998). Other biomedical journals, including the New England Journal of Medicine and the American Journal of Roentgenology, have published articles within the last decade that revealed their own peer-review processes to their readers and potential authors. In addition, three meetings have been held by the International Congress on Biomedical Peer Review in 1989, 1993, and 1997. Among the small but growing body of published articles on biomedical peer review, this paper stands out as a report of a unique case: a specialty journal with a small editorial board whose members review all submissions.
and remain unblinded to each other’s opinions. How can JNS justify its rarity?

Small Number of Reviewers

The small number of editorial board members of JNS could be considered a shortcoming of its peer-review process. Because peer review is a human process, no reviewer can remain completely objective and ignore the biases for or against specific procedures, technologies, or even particular authors or institutions. Because each of JNS’s reviewers evaluates a large number of manuscripts, each reviewer’s personal biases could extend to hundreds of manuscripts. Shared biases among members of the editorial board could cast bias on the overall focus of JNS.

For journals that use hundreds or, in the case of larger journals, thousands of reviewers, an individual’s biases are not so influential. This drawback, however, may be outweighed by the potential benefits of a small, closely knit editorial board. At JNS, the editor knows each of the board members personally and is well acquainted with their specific areas of expertise as well as their potential individual biases. One author who analyzed peer review explained that all editorial boards have their own “assassins” and “zealots,” reviewers with overall biases toward rejection or acceptance of manuscripts, respectively. By knowing which reviewers may tend toward these biases, the editor of JNS can tailor the most fair assignment of manuscripts.

Furthermore, the reviewers know each other well, including each individual’s strengths and weaknesses, specific experiences, and personal influences. When considering each other’s comments, they can place them within the context of this knowledge. The editor and the reviewers maintain open lines of communication. All of these factors, resulting from a core of reviewers, fosters an internal quality control—a continual peer review of the peer reviewers.

Another potential benefit of JNS’s small editorial board is that the reviewers become highly experienced, especially given their long tenure and the large number of papers they review each year. The importance of reviewer experience, however, is difficult to study and has not been clearly defined. A Swedish study showed that two characteristics of reviewers were associated with a more careful evaluation of manuscripts: young age (<50 years old) and experience level (≥10 manuscripts reviewed per year). In contrast, another study found that the quality of a review was not correlated with the number of papers reviewed in the past year; the only consistently significant factor correlated with better reviews was prior training of the reviewer in epidemiology or statistical analysis.

Unblinded Review

The concept of “blinding” has many variations in the peer-review process: blinding of reviewers to authors, authors to reviewers, and reviewers to each other. The JNS TABLE 1

Comparison of journal statistics and peer-review characteristics between the Journal of Neurosurgery and other selected journals

<table>
<thead>
<tr>
<th>Journal</th>
<th>No. of Issues/ Yr</th>
<th>No. of Ms Received/Yr</th>
<th>Acceptance Rate (%)</th>
<th>No. of EBM</th>
<th>No. of Ms Reviewed/ Yr/EBM</th>
<th>No. of Reviewers/ Ms</th>
<th>No. of OR</th>
<th>Percent age of Ms W/ OR</th>
<th>Rev to Author</th>
<th>Rev to Rev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal of Neurosurgery</td>
<td>12</td>
<td>11,969</td>
<td>1,120</td>
<td>28</td>
<td>12+2 C</td>
<td>227†</td>
<td>3+</td>
<td>var</td>
<td>43</td>
<td>no</td>
</tr>
<tr>
<td>Annals of Internal Medicine</td>
<td>24</td>
<td>93,439</td>
<td>2,300</td>
<td>15</td>
<td>18</td>
<td>—</td>
<td>2</td>
<td>10,000</td>
<td>50–55</td>
<td>no</td>
</tr>
<tr>
<td>Archives of Otolaryngology—Head and Neck Surgery</td>
<td>12</td>
<td>11,144</td>
<td>450</td>
<td>40</td>
<td>19</td>
<td>10</td>
<td>2</td>
<td>1,000</td>
<td>75</td>
<td>no</td>
</tr>
<tr>
<td>Journal of Bone and Joint Surgery</td>
<td>12</td>
<td>36,500</td>
<td>1,000</td>
<td>10</td>
<td>24</td>
<td>20</td>
<td>2–3</td>
<td>hundreds</td>
<td>100</td>
<td>yes</td>
</tr>
<tr>
<td>Journal of Cardiac Surgery</td>
<td>6</td>
<td>1,906</td>
<td>120–130</td>
<td>65</td>
<td>30</td>
<td>6</td>
<td>2</td>
<td>—</td>
<td>30</td>
<td>no</td>
</tr>
<tr>
<td>Journal of the American Medical Association</td>
<td>52</td>
<td>340,000</td>
<td>4,300</td>
<td>11</td>
<td>25</td>
<td>2</td>
<td>3</td>
<td>12,000</td>
<td>50</td>
<td>no</td>
</tr>
<tr>
<td>Nature</td>
<td>52</td>
<td>57,000</td>
<td>8,000</td>
<td>9</td>
<td>20</td>
<td>IHE</td>
<td>—</td>
<td>2–3</td>
<td>&gt;10,000</td>
<td>yes</td>
</tr>
<tr>
<td>Neurology</td>
<td>18</td>
<td>18,000</td>
<td>2,500</td>
<td>20</td>
<td>36</td>
<td>25–50</td>
<td>4</td>
<td>—</td>
<td>99</td>
<td>no</td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>12</td>
<td>10,062</td>
<td>1,331</td>
<td>26</td>
<td>66</td>
<td>var</td>
<td>4+</td>
<td>465</td>
<td>90+</td>
<td>no</td>
</tr>
<tr>
<td>New England Journal of Medicine &amp; SR</td>
<td>52</td>
<td>240,000</td>
<td>3,600</td>
<td>10</td>
<td>24</td>
<td>20</td>
<td>2–3</td>
<td>15,000</td>
<td>100</td>
<td>no</td>
</tr>
<tr>
<td>Ophthalmology</td>
<td>12</td>
<td>25,905</td>
<td>890</td>
<td>33</td>
<td>26</td>
<td>11</td>
<td>2–3</td>
<td>894</td>
<td>95</td>
<td>no</td>
</tr>
<tr>
<td>Plastic and Reconstructive Surgery</td>
<td>12</td>
<td>13,000</td>
<td>1,200–1,600</td>
<td>35–40</td>
<td>27</td>
<td>—</td>
<td>3</td>
<td>—</td>
<td>40</td>
<td>no</td>
</tr>
<tr>
<td>Science</td>
<td>52</td>
<td>160,000+</td>
<td>7,000</td>
<td>10–15 biol, 22 phys</td>
<td>94 EBM, 15 staff</td>
<td>var</td>
<td>1+ staff, 1 EBM, 2+ OR</td>
<td>&gt;10,000 (4000/yr)</td>
<td>100‡</td>
<td>no</td>
</tr>
<tr>
<td>Surgery</td>
<td>12</td>
<td>6,171</td>
<td>1,000</td>
<td>8</td>
<td>50</td>
<td>24</td>
<td>3</td>
<td>—</td>
<td>50</td>
<td>yes</td>
</tr>
<tr>
<td>Surgical Neurology</td>
<td>12</td>
<td>2,150</td>
<td>550–600</td>
<td>28</td>
<td>68</td>
<td>0–10</td>
<td>2</td>
<td>&gt;300</td>
<td>95</td>
<td>no</td>
</tr>
</tbody>
</table>

* Biol = biological; C = chairman; circ = circulation; EBM = editorial board member; IHE = in-house editor; Ms = manuscript; NA = not available; OR = outside reviewer; phys = physical; rev = reviewer; SR = statistics review; var = variable; — = not applicable.
† Not including chairmen.
‡ If passed by editorial board.
§ If passed by in-house review.

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Peer-review process

does not blind its reviewers to the identity of the authors. This could be seen as a potential weakness of JNS’s peer review. Reviewers may inadvertently cast biases on manuscripts because of their knowledge of the authors or their institutional affiliations. Blinding reviewers to authors has been postulated to produce less biased, better-quality reviews.610 However, other studies have shown no benefit to such blinding.8,10,16 In addition, not only is blinding a logistical hassle, it may be impossible. One study of a specialty journal showed that almost half of the blinded reviewers correctly guessed the identity of the authors, based on either the subject matter or clues within the text.6

The blinding of authors to the identity of the reviewers is a separate issue. As is the common practice, JNS sends anonymous reviews to authors of submitted manuscripts. Although this system may encourage reviewers to make comments for which they cannot be held personally accountable, it may also allow them to make more honest reviews.13 Interestingly, one study found that reviewers who were asked to sign their reviews were slightly less likely to reject a paper than reviewers who remained anonymous (this difference was not statistically significant).8 However, because that study was the only one we found that focused on reviewer anonymity, the importance of this aspect of peer review remains unclear.

We were unable to find any literature that specifically addressed whether reviewers should be blinded to each other. Perhaps the subject has been unexplored because to our knowledge, JNS is the only journal in which reviewers are not blinded to each other. At the American Journal of Roentgenology, an arbitrator may receive other reviewers’ comments during the review process, but this is an exception to their standard procedure.7 The most significant potential risk of this open review style is obvious: reviewers may be influenced by each other’s opinions and, as a result, manuscripts may receive an unfair review. Equally possible, however, is that the sharing of opinions leads to reviews of better quality.

A similar concept is commonly accepted in the clinical realm. The sharing of a consultant’s opinions regarding the management of a patient, for example, is often in the patient’s best interest. Each physician may have an idea that the others had not considered. This collaborative process of weighing a consultant’s opinion against one’s own is potentially more fruitful than two independently developed decisions.

Power of the Editor

Although journal editors tend to have absolute power over what is published, this authority is exercised in different ways by different editors. This variation largely depends on how the editor views the role of the reviewer. Reflecting on their peer-review process, the editors of the New England Journal of Medicine stated:

The reviewers act as consultants to the editors . . . although we pay attention to the reviewers’ recommendations about publication, we are far more interested in the substance of their comments. We see peer review not as a straw vote on whether a particular manuscript should be published, but as a source of information and advice, particularly technical advice, that will not only help us decide about publication but also how to improve the paper.7

The editors explain that because they view reviewers as consultants and not decision makers, concordance among reviewers is not necessarily important. In certain cases, they intentionally seek discordant reviews to learn what is best or worst about a manuscript. This scenario, in which the editors make the final publication recommendations despite disagreement among reviewers, gives the editor considerable power. Under these circumstances, the editor’s own biases can influence the quality and focus of a journal.

At JNS, the editor does not ordinarily accept or reject manuscripts against the editorial board’s recommendations. The reviewers supply numerical scores that are combined to form a final grade for each manuscript. It would be unusual for a manuscript that was strongly recommended to be rejected by the editor. Similarly, if a paper was strongly rejected by the reviewers, it would be unusual for the editor to accept it. It is in cases in which a manuscript falls somewhere between rejection and acceptance that the editor uses his discretion to accept, reject, or request revision. In the unusual event that the editor strongly disagrees with the reviewers, additional reviewers are assigned. If the recommendations of the additional reviewers also oppose the editor’s opinion, the collective reviewers’ decision is likely to prevail. This process places a check on the power of the editor and helps prevent the editor from single-handedly influencing a manuscript’s fate.

Conclusions

The JNS has a unique peer-review philosophy: reliance on an unusually small, experienced editorial board whose members remain unblinded to each other’s manuscript reviews. Our discussion not only elucidates this system for JNS’s readers, but also brings it to light within the larger context of the growing body of peer-review research. Although the integrity of its peer review system cannot be scientifically proven, JNS demonstrates both subjective and objective markers of excellence among scientific journals.

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