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Peer review is a cornerstone of the scientific process, with an aim to “optimize scientific progress, enhance reproducibility, and eliminate poor quality science.”1 Despite this lofty aim, little training—formal or informal—exists for surgeons who volunteer their time for this purpose.2,3 It has been suggested that this lack of comprehensive training threatens the quality of published articles.4 In turn, this has a negative effect on the quality of clinical guidelines, meta-analyses, and ultimately, treatment recommendations and patient care.5,6 Given the wide variety and number of scientific journals that exist it would likely be both impossible and impractical to define consensus guidelines for all peer review. It is nonetheless challenging for editors and reviewers to be faced with such significant variation in grading and grading criteria for submitted manuscripts across the surgical literature.

Peer review carries important weight for the reviewer; it does require volunteerism and time commitment and constitutes an ethical responsibility and service to the field. It is also a privilege. Being selected as a peer reviewer confers a recognition of expertise in the field. It is an opportunity to contribute to the quality of medical literature and practice and allows for an inside view of new directions within the discipline. It is an important stepping stone for career advancement, in particular, as it relates to editorial roles within academic publishing. While this represents an important opportunity for junior reviewers, it is imperative that reviews be rigorous and of high quality.

The volume of articles submitted to medical journals has grown exponentially in recent decades, with over two million peer-reviewed articles published annually in over 25,000 journals.7 With this influx of submitted articles, comes an increasing need for peer reviewers. At the same time, the resources of experienced reviewers are becoming saturated, leaving more reviews to less-experienced reviewers.8 There are a number of well-written articles across disciplines on peer review. This article aims to provide an overview of best practices in peer review for the surgical literature.

WHAT TO CONSIDER WHEN DECIDING TO ACCEPT A REVIEW

Peer review is a key component to ensuring the validity and quality of scientific manuscripts. However, before accepting the request, there are 4 key factors a reviewer must consider to ensure that the review process is fair, thorough, and valid.6

Do You Have the Expertise Necessary to Review the Manuscript?

A potential reviewer may not be an expert in the exact topic that the manuscript covers, but they should have some familiarity with the general field and type of research. For example, if a reviewer is a surgical oncologist, it is probably appropriate to review manuscripts for general surgery and oncology topics, whereas vascular surgery topics may be outside their scope of knowledge. Similarly, if a reviewer is familiar with surgical outcomes research but has never spent any time in a basic science lab, it is probably more appropriate for them to review outcomes papers rather than basic science papers. In general, a reviewer should ask themselves whether they can provide an informed, educated opinion of the work they may review before they accept the assignment.

Are You Able to Perform the Review in a Timely Manner?

All review requests include a deadline for the review in their offer. This is usually around 2 weeks from the time a reviewer accepts the review request, but timing may vary based on the journal. A reviewer should make sure to review this deadline

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Review Paper


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and verify that they can meet it. A potential reviewer is better off declining an offer to review than missing the deadline, as both journals and authors rely on timely reviews to maintain the efficiency of the publication process.

Are You Committed to Conducting a Thorough Review?

Some journals will provide reviewer guidelines similar to author guidelines, giving direction on how the journal would like manuscripts to be evaluated. These instructions can be very helpful, and, perhaps, it should be the responsibility of all journals to give a potential reviewer some direction and level of expectation that is journal-specific. If such reviewer guidelines are available for a journal, it is appropriate as a potential reviewer to read these materials in advance of acceptance of an offer for peer review. A reviewer should be willing to review the manuscript in the manner recommended by the journal.

Similar to point #2, a reviewer should make sure they have the time, energy, and interest to complete a thorough, constructive review before accepting a review request. A partial or abbreviated review is detrimental to the process and unfair to the authors. If a reviewer does not have the time or interest to thoroughly read the manuscript and provide point-by-point constructive feedback, they should decline to review the manuscript.

Do You Have a Conflict of Interest That May Interfere With Your Ability to Provide an Unbiased Review?

Conflicts of interest can come in a variety of forms, ranging from financial to personal. In general, if a reviewer or their spouse has a financial interest in the topic of the manuscript, that would be considered a conflict of interest. Similarly, if the author is either a close friend or enemy, this may bias a reviewer’s opinion of his or her work. Often, potential conflicts of interest fall into a “grey” zone, where one is unsure of how much the perceived conflict would impact one’s ability to provide a fair review. In these instances, a reviewer may reach out to the editor to explain their concerns, and he or she can help decide whether or not the assignment is appropriate.

It is similarly important that a reviewer expand their knowledge of a journal, its particular peer-review standards, and its potential as a predatory for-profit open access journal. It is certainly possible to be able to offer a comprehensive professional review for such a journal, but one should consider that a “journal,” even with a very legitimate-sounding title, may actually have unethical or very low standards. In some cases, journals may have a policy of refusing to reject submissions regardless of quality or integrity, may have little or no actual editorial oversight, and often charge exorbitant fees for publication. A potential reviewer has the responsibility of verifying the source of the peer-review request and to consider their role in discouraging predatory journal behaviors.

If a reviewer is able to answer “Yes” to each of the first 3 questions and does not have a conflict of interest, then they should accept the offer to review.

KEYS TO A GOOD REVIEW

The overall goal of peer review is to evaluate the manuscript for quality, content, and scientific contribution. One approach to manuscript review should be to provide feedback that will help the authors improve their work and make it acceptable for scientific publication. Regardless of whether or not the manuscript is high-impact and well written, or of low interest and poorly written, a review should aim to provide constructive criticism to make it better. Even the worst manuscripts deserve a professional, constructive review. It is okay that a reviewer may not be able to make a manuscript perfect—or even publishable—with their comments and suggestions. They should keep in mind that most articles are submitted to more than one journal and undergo multiple rounds of revision before they are finally published. A review should be constructed with the goal of assisting in that process while at the same time, ensuring that papers demonstrate the highest quality for surgical publication.

The Review: Questions to Consider During the Review Process

A comprehensive and thorough review should consist of careful evaluation of the following key components.

What Is the Importance or Potential Effect of the Study?

One of the most important considerations when a reviewer begins the review process is to consider the scientific merit of the study. A reviewer should examine the abstract and introduction. The authors should have a clear and persuasive justification for undertaking the study, as well as an explanation for the potential consequences of the paper. A reviewer should contemplate whether or not the results could improve clinical care, address a critical knowledge gap, or pave the way for future investigations. A reviewer should keep in mind that there are many ways for a study to be clinically relevant. Most papers submitted for review in surgical journals are not 100% novel and are likely based on prior data either directly or tangentially. What is more important is how the authors have developed their objectives and have justified a meaningful and unique analysis that contributes to the literature. To evaluate the effect of the study, it may even be necessary to do a brief literature search on the topic, especially if the topic is not within a reviewer’s precise area of expertise. This provides the reviewer with some fundamental background knowledge on the topic, which will enhance the evaluation.

Why Is the Study Being Performed? What Data Exist on the Topic?

First, a reviewer should carefully review the introduction as mentioned above. Have the authors clearly defined the importance of the study? What knowledge gaps exist in the current literature that warrant further investigation? As in question #1, a reviewer should consider spending some time briefly reviewing prior publications. It is important that a reviewer identify whether or not the authors have defined a clear hypothesis with appropriate objectives. It is possible that a study will have simply duplicated prior published results with little additional novel information. While there is room within most scientific literature for proving the reproducibility of results, a reviewer should be aware of where the study fits within the body of existing and related literature. A reviewer should be able to comment on the novelty or additive benefit of a given study. In addition, a reviewer should try to assess whether the results were obtained from a priori objectives or rather were found through extensive data manipulation.

Is the Methodology Well Described and Appropriate?

One of the most essential parts of the review is to assess the methodology to determine the accuracy and validity of the results and conclusions. A reviewer should determine the study design, as this will also affect the appropriate choice of statistical methods for analysis. Many surgical papers are retrospective cohort studies, which assess various clinical outcomes. Other common study designs found in the surgical literature are listed in Table 1. Data may often be reported as prospective based on the use of a prospective database, when in fact the
outcomes assessed are actually retrospective. A reviewer should assess whether or not the design was appropriate to meet the objectives of the study. For example, large national databases are useful to study outcomes related to rare diseases for which a prospective study or single-institution study may not be feasible. All randomized controlled trials (RCTs) should adhere to the guidelines of Consolidated Standards of Reporting Trials (CONSORT) Statement.9 Meta-analyses and systemic reviews should follow the Preferred Reporting Items for Systemic Reviews and Meta-Analyses (PRISMA) guidelines.10 Survey-based studies should follow the STROBE guidelines.11 If it is an animal or laboratory study, are the analyses done properly (eg, proper controls used with the Western Blots)? Are the results appropriately repeated (eg, done in triplicate)? and are they able to be replicated?

Next, a reviewer should evaluate the study population. Will the results be generalizable based on the patient demographics? What are the inclusion and exclusion criteria? Were they chosen appropriately? Have the authors clearly defined the patient cohorts? Finally, a reviewer must consider how the study design affects the potential for various confounders, selection bias, or other biases, which may alter the results.

The most challenging problem in the results section can be a lack of clarity in writing. For example, a manuscript may categorize hospitals as small, medium, or large. If the authors then write, “Smaller hospitals were more likely to have long length of stay,” what does that mean? Were they comparing small hospitals to all other hospitals or to large hospitals? What is a “long” length of stay? Often authors are so close to the work that they know which comparison they are intending to share and may not see the ambiguity. Reviewers serve an important role in ensuring clarity. If qualitative research is being reported, a lack of clarity in writing. For example, a manuscript may lead to a type 2 error due to small sample size. Next, a reviewer should assess whether or not the measures of the primary outcome are appropriate or if they adhere to established guidelines. For example, are the authors using an established definition of pancreatic fistula based on amylase levels or are they using an arbitrary definition? When examining patient cohorts a reviewer should assess if the appropriate variables were included in these models and why.

In regards to the primary and secondary outcomes, were the appropriate statistical tests used? This depends on the type of variable reported: either continuous (eg, age, melanoma Breslow thickness) or discrete/categorical (eg, sex, primary site). Furthermore, the choice of statistical tests is also dependent on the distribution of the data (normal versus non normal should be analyzed with parametric versus nonparametric tests, respectively). The results should be presented and reported accordingly: mean with standard error of the mean for normally distributed data versus median with interquartile range for non normal data, or frequency and relative frequency for discrete variables. All P values should be reported with or without 95% confidence intervals as appropriate. Statistical tests may include the test statistics (eg, F or t) in addition to P values. Finally and most importantly, a reviewer should determine if the results are statistically significant, clinically significant, or both.

Are the Results Valid? Are the Measures Appropriate?

Although one could make a case for the importance of every section of a manuscript, the results are arguably the most important because they determine what the significance of the manuscript will be. In evaluating the results, the reviewer has to critically assess whether the analyses are clearly reported and appropriate based on the data and study aims. For example, if researchers perform a linear regression to assess various factors that may be associated with well-being, they must clearly report the dependent variable, or outcome, in the regression as well as the variables included in the regression. The latter should be accompanied by an explanation of why those variables were included. The different levels of each variable also should be clearly described. For example, if researchers are examining the likelihood of complications after a procedure and one variable in their analysis is hospital size, what are the different sizes and how are they defined? Without all this information, the reader cannot know what analysis was done or how to appropriately interpret it. When statistical tests are reported, researchers should report multiple measures when appropriate, such as confidence intervals, test statistics, and P values rather than P values alone.

Sometimes a reviewer may not be familiar with the statistical analyses being reported. Depending on the journal, a reviewer may be able to request that the article be reviewed by a statistician. It is helpful to spend a few minutes doing a brief search, if need be, to understand the methodology to make a more informed review.

Often figures and tables are used to illustrate the results. These should only be included if they help readers understand the study. Figures should illustrate key points that may be difficult to understand without a figure. Tables are often used to convey many pieces of information in a succinct manner. Typically the first table in a manuscript summarizes the demographics of the participants. Any subsequent tables can include results of important analyses. Both figures and tables should have appropriate, descriptive titles. All table and figure abbreviations should be spelled out in a note or legend.

Are the Conclusions Supported by the Data? Are They Relevant, Novel, etc?

In the discussion and conclusion, the authors should synthesize their data into a few key points. It is important to be realistic about what their data do and do not show. For example, a small single-center study likely should not be characterized as revolutionizing a field. If the authors found, for example, that those who had a colectomy at small hospitals were more likely to have complications than those at large or medium hospitals,
the authors should not jump to the conclusion that people should not have colectomies at small hospitals. It would be more useful and appropriate for them to consider what other factors may have accounted for this difference and how to mitigate those factors. In addition, one key point that should be addressed in the discussion is the practical significance of the results—are there statistically significant findings that are not actually meaningful? Or are the findings meaningful? For example, just because the authors have found a statistically significant difference in the study, is it clinically significant? It is natural for authors to think of their work as having major significance, and sometimes it does. However, more often, research articles add incrementally to knowledge in a specific field. One main purpose of the discussion is to place the current work in the context of the work that has preceded it. A well-written discussion will contain the key take-home points from the data in the manuscript and explain how those results change or add to what was known before, in a measured and thoughtful way. If the authors are overstating their findings or their significance, a thoughtful review can help temper that and make sure the conclusions are justified and reasoned.

**Structure of Submitting the Review**

Any reviewer should plan to perform a standardized systematic approach to manuscript review as detailed above. Many journals will have dedicated reviewer forms in which specific aspects of the article will be “graded,” however, these forms vary greatly among surgical journals, so the most important and actionable review recommendations should be detailed as a report in the commentary section. Comments should include the strengths and weaknesses of the paper as well as constructive suggestions to authors for improvement of the study and manuscript. 

Manuscript review comments should again follow a systematic template, consisting of “General Comments,” followed by more specific “Major Comments” and “Minor Comments.” "General Comments” should consist of a concise summary of the reasons and goals behind the study, methodology, and major findings/implications of the study. This section demonstrates reviewer understanding of the major study points to both the authors and the editorial board. In some cases, these comments may demonstrate to the authors and editors that the major points taken from the manuscript may not be completely aligned with the original author goals, which may be a point addressed in “Major Comments.”

The following two sections are suggested to be written in a numbered, list-style format for ease of subsequent author revisions. “Major Comments” should address the overall viability of the manuscript. Specifically, major comments should address the scientific/clinical need for the research question, the completeness of background literature review to support the research question, clarity of the hypothesis and objectives, the viability of study design and methodology, reporting of results, and the appropriateness of conclusions and practice-changing recommendations. Each point should be met with (a) specific example(s) from the manuscript as well as specific suggestions for improvement. Finally, it is also important to comment on suitability of the manuscript for the specific journal with attention to subject matter and readership base. This is where knowledge of the journal and its stated scope and purpose can be helpful. It is the responsibility of the reviewer to familiarize themselves with a journal if they have no prior experience with it.

“Minor Comments” should include less fundamental, but still essential to publication, line items including manuscript organization, clarity of writing, and grammatical points. Figures and tables should be closely reviewed for clarity and supporting relevance to the content of the manuscript. The bibliography should be reviewed for completeness and appropriateness, and major missing relevant studies should be identified and suggested for inclusion. Potential conflicts of interest should be addressed. It is also suggested that the title and abstract of the paper be strongly critiqued, as these are the most visible aspects of the manuscript and will be the tools that readers use to filter for reading.

Finally, before submitting a review, it should be remembered that the goal of the review is not to tear apart the research and make the authors feel bad. The point is not to reject the work because they did not do the perfect study—no one did a perfect study. Asking authors to repeat the study with a different methodology or with different participants or different questions is often not helpful or feasible. However, suggesting different analyses or ways of approaching their data may be helpful, where indicated. A reviewer should think about what kind of feedback they would want on their own work—and try to provide that.

**Checklist of Key Elements of the Review**

Once a reviewer has accepted a request to serve as a peer reviewer, they will need to formulate two primary responses, one for the editor(s) and one for the author(s). The role as reviewer essentially equates to that of an ambassador speaking on behalf of the manuscript to each interested group. To that end, providing an organized and formulated assessment will be equally beneficial to both parties. The following checklists for comments directed to authors and editors can be used as a guide as one works through the formal assessment of a manuscript (Tables 2 and 3).

While a reviewer may choose not to provide author comments on every aspect of a paper, it is helpful to think about each item in an organized fashion such as that provided below. A reviewer may elect to comment sequentially or focus their comments on those items that are done exceptionally well and those where more detail, clarification, or significant correction of discrepancies is warranted. Authors want to know that a reviewer gave their manuscript their full attention and understood its key points. For manuscripts that are descriptive in nature rather than experimental, such as a review article, technical paper, or meta-analysis, the nature of the review will need to change accordingly dependent upon the format.

Once a reviewer has completed their author-directed comments they can then synthesize their impression and recommendations as comments to the editor(s). Most typically, these are confidential comments meant to concisely describe the major strengths and weaknesses of the manuscript. These comments should include a definitive recommendation for manuscript acceptance, revision, or rejection.

**REVIEWING A REVISED MANUSCRIPT**

Often a reviewer will be asked to indicate their willingness to re-review a manuscript after any necessary revisions have been made. Editors typically prefer to maintain the consistency of reviewers to help determine if any recommendations for revisions have been adequately addressed by the authors. Reviewing a revised manuscript follows a similar process as an initial review but can be somewhat more directed. This is often made easier if authors are asked to highlight any specific changes that have been made.

Most commonly, an author will be asked to respond directly to each recommendation made by the reviewers. Upon accepting an offer to review a revised manuscript, a reviewer should have access to all initial reviewer recommendations as well as the authors responses to those recommendations. A reviewer should attempt to comment directly on the adequacy of an author’s changes as they relate to the initial reviewer recommendations. A reviewer should attempt to refrain from listing new issues unless they arise as a result of additions or deletions from the original manuscript. As an ambassador for the merits of the manuscript, a reviewer should attempt to avoid arguing with an author through a review. On occasion an author may reject

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Greco et al • Annals of Surgery (2021) Ta027

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a reviewer’s recommendation, and it is up to the reviewer to assess whether the explanation makes sense, is acceptable, and if the paper should be published without those recommended changes. If an author fails to address specific recommendations, then it is certainly appropriate to indicate to the editors that there are outstanding issues that need to be addressed before a recommendation for acceptance can be given.

Reviewing a revised manuscript will again require a review to indicate their opinion regarding the need for additional major or minor revisions or the acceptability for publication. Once given, a reviewer’s recommendations will be considered by the editor(s) and a formal decision made. It is not uncommon to be asked to review a manuscript multiple times before formal acceptance or even rejection is ultimately made.

**CONCLUSIONS**

It is important as a surgeon to participate in the peer-review process to help advance quality investigation and discovery in all areas of surgery. There are benefits to both the field of surgery and to the reviewer to do this in a professional, unbiased, and timely manner. The reviewer has a significant responsibility to both the author(s) and the journal editor(s) to identify areas of strength and weakness and offer constructive assessment to help improve in any way possible a potential publication. This requires an important combination of integrity, clarity, alacrity, and positive outlook.

It is important for reviewers to align themselves with manuscripts within their area of expertise to be able to offer the best vantage point for the authors and the editors. Recommendations should always strive to help advance the quality of the research.
effort rather than tearing it down. Authors appreciate positive feedback but also value helpful suggestions that will fundamentally strengthen a paper. Overly negative comments that offer no constructive feedback are typically of minimal benefit. Even if the manuscript is not accepted for publication with the journal for which a reviewer is providing the review, constructive comments can hopefully support a successful submission elsewhere. With these things in mind, authors and editors alike will appreciate timely, honest, and supportive reviews.

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REFERENCES