Introduction to Peer Review

August, 2020

Welcome

We are excited that you are interested in becoming a peer reviewer for the *Annals of Emergency Dispatch & Response* (*AEDR*)! We're always looking for people with experience and interest in emergency dispatch, health care, public health, public safety, and other related fields to provide the critical feedback that holds emergency dispatch research to the highest scientific standard.

At the end of this course, you will be able to:

- Define peer review and explain its purpose
- Briefly explain the history of peer review
- Describe the benefits and potential critiques of peer review
- Provide an overview of the peer review process
- List the four major components of a complete review
- Explain some of the characteristics of a good review
- Write effective, relevant review comments/recommendations

You will also have an improved understanding of how you can contribute to the peer review process, even in areas in which you don't feel like an expert. We hope that your new knowledge in these areas will help you feel confident in your ability to review for *AEDR*.

What is Peer Review?

In simple terms, peer review is the process of ensuring that the claims made by a research paper are clear, ethical, scientifically sound, and important. We will look at each of those terms in more detail later. The point is that peer review is **a method for ensuring that the claims made by a research paper can be understood, are supported by the evidence provided, and will be of interest and value to other readers in the same field**. The term itself refers to the idea that the review (reading and commenting on or critiquing the paper) will be done by peers (colleagues or experts) in the same or related field of study.

Peer review accomplishes its important job by ensuring that multiple experts or practitioners in the field have had a chance to read and respond to every paper before it is considered for publication. The editor of the publication selects a small group of reviewers (often three, to avoid ties) and sends the paper to each of them. Generally, the papers are "blinded," meaning that the reviewers don't know who the authors of the assigned paper are. This process is intended to promote objectivity and reduce bias. The authors usually don't know who reviewed the paper either; that way, they can focus on the comments rather than the individual reviewers.

In the same way that asking a friend to read a school paper helped you make sure you didn't miss any errors, asking peers to review papers helps journals make sure that the papers they accept are worth publishing.

The History of Peer Review

The first dedicated scientific journal in the world, *Philosophical Transactions of the Royal Society*, was founded in 1665. At that time, most scientists were private citizens, usually wealthy gentlemen with the resources, education, and time to conduct scientific experiments in their own homes. In fact, the term

"scientist" did not even exist until 1834 because it was not considered a separate profession. As a result, the papers these early experimenters published were not scientific reports as we know them. They were written in the form of letters addressed to the Secretary of the Royal Society, who edited and ran the journal.

Philosophical Transactions was popular among those interested in scientific discovery, but it had two significant problems. First, most of the "scientists" worked alone, and each simply reported his own findings with no oversight. This meant that it was almost impossible to know whether the claims were true. Second, when major discoveries were made, they were often made by two or more experimenters at the same time, and there was no way to determine which had actually made the discovery. To help solve these problems, the secretary began sending the letters out to trusted friends and colleagues, who would comment on the experiments being described. It was not a formal process, but it did help experimenters know what others were working on (thus reducing duplicated efforts), and it also provided oversight to determine whether the claims made were likely to be true. In some cases, the reviewers even reproduced and tested the experiments themselves.

The method worked. Over the next century, the number of scientific journals, the number of papers published in those journals, and the number of scientists participating in the broader field through writing and reading reviewed articles increased exponentially. As a result, science started to become a coordinated effort among the many different scientists, not just a collection of individuals working along separate lines. The peer-reviewed publication process changed the way science was conducted and made it the powerful force it is today.

Benefits of Peer Review

Verification

The main benefit of peer review is that it ensures at least one expert in the field has seen the paper before it is accepted for publication. An editor—even an editor of a relatively specific journal in a small field—can never be an expert in every area the journal covers. For example, an editor of a cardiology journal may be a cardiologist who has been seeing heart disease patients for 20 years or more. Yet that person may still have little or no experience with pediatric cardiology. Similarly, despite all those years of experience, he may be a generalist (and therefore not a specialist in any individual disease), or he may be a specialist in one disease, with less knowledge of related diseases. Moreover, no editor can be a specialist in every possible method a researcher might use. Having a group of experts to verify the work of authors ensures that the journal does not publish false claims or research based on questionable methods, no matter what the specific topic.

Relevance

Peer review also helps the editor know which material is relevant, timely, and important to people in the field. Not every study, even if properly conducted, is of equal interest—and only those who actually research or practice in a particular field know, at the moment, what is of most interest in that field. Because journals often have limited space, they use peer review to make sure that what gets published is what the readers actually want, or need, to know.

Objectivity

Another benefit of peer review is that it helps editors to remain objective. Most peer review is blinded, meaning that the reviewers don't know who wrote the paper. This attribute can reduce the likelihood that personal likes and dislikes, or biases against certain people or groups, will influence the editor's decision. Moreover, because multiple people review the paper, no individual's biases—including biases against certain types of research or certain methodologies—can overly influence the decision.

Scientific advancement

It's important to remember that peer review doesn't only have benefits for the editor and the journal. If done well, peer review can help researchers improve their papers, and even the studies themselves, by providing feedback, questions, and critiques. And peer review also benefits the scientific community in general. It allows reviewers to see important work earlier than they would otherwise, and it also creates a sense of a unified effort within a field by offering a way to participate in, and help improve, other researchers' work.

Reviewer enrichment

As well as helping authors advance the science, the peer review process also helps reviewers closely follow key developments in the field, even before those developments are more widely shared through publication. Also, as subtle as it may seem, serving as a peer reviewer looks good on your resume or CV as it shows that your expertise is recognized by other scientists—your peers. Additionally, exposure to expert knowledge from other researchers can trigger important research ideas for reviewers.

Community

Finally, researchers tend to be isolated, working in their own labs on relatively narrow questions. Peer review gives researchers who are relatively isolated a point of contact to the larger scientific community.

In general, the more people who read the papers submitted to a journal, the more likely it is that good papers will be recognized and poorly constructed or biased studies will be weeded out. Peer review is a methodical way to ensure that this happens.

Critiques of Peer Review

Bias

Despite its many potential benefits, peer review has come under some criticism in the past 15 to 20 years. In fact, some research has been conducted on peer review itself, leading to some questions about whether peer review is really doing what it is intended to do. Some studies, for example, found that peer reviewers themselves tended to be biased, either preferring papers that supported their lab's findings or rejecting papers that they thought competed with their own work.

Fraud

Moreover, a number of studies found that peer review may not necessarily increase the quality of published papers or reduce fraud. Because it is impossible for peer reviewers to physically reproduce the experiments the researchers did, they can't actually *know* whether the findings are stated truthfully.

Some high-profile data fraud cases have brought this problem to light, suggesting that in fact it is almost impossible to know whether data, if presented convincingly, are made up or were really observed.

Delay

Some have also argued that the entire process of peer review simply takes too long and may oppose innovation. Reviewers tend to be well-known experts in a given field, meaning that they tend to be relatively experienced and, potentially, more conservative or more likely to question new ideas. In addition, the peer review process can take a few months or, with some journals, even more than a year, with some papers being published two or three years after they were submitted to the journal. Given that one of the key purposes of the scientific method is to allow researchers to build on each other's findings, holding on to papers for a year or more before publication can seriously delay the entire process of information discovery. The lag time also limits what the authors themselves can do with the findings and almost ensures that the data collected will be somewhat out of date by the time they are published.

Alternatives

A number of alternatives to peer review have been proposed. One such proposal allows scientists to simply publish their work in a public forum where other researchers can comment. This makes the entire process more transparent, gets findings into the community more quickly, and allows a much broader range of "reviewers" to comment on the paper. Other journals have used the unlimited space of the internet to publish "addendum" material online, meaning that researchers who are interested can review the authors' entire data set. This practice reduces fraud because the study's authors must actually be able to back up their claims with an entire set of observations.

However, despite the criticisms of the traditional peer review method, and despite the growing interest in alternative methods, **peer review remains the best option available**. Technologies such as online forums may one day offer viable alternatives to traditional peer review, but for now, the process is the best we have to ensure that, as much as possible, the work we publish is scientifically sound, clearly written, and timely.

In short, peer review is a lot like science itself: it's human and complicated and problematic and potentially flawed—but for now, it's the best we have.

The Peer Review Process

The peer review process involves 11 steps:

1. The authors submit the paper to the journal. Generally, this involves an online submission page accessed via the journal's website. In the case of *AEDR*, submissions are also accepted via email.
2. The editors decide on the paper's relevance. At this stage, the editors simply determine whether the paper fits the overall scope, focus, and purpose of the journal.
3. For relevant submissions, the editors select the most appropriate reviewers, based on their areas of expertise.
4. The paper is anonymized and sent to the reviewers, generally along with a set of guidelines for conducting the review. In the case of *AEDR*, we supply a set of questions and prompts.

5. The reviewers have a set period of time in which to read the paper and submit their comments and recommendation. This period is commonly about 2–3 weeks.
6. The editors review the comments from all the reviewers and make the editorial decision (accept, resubmit, reject).
7. The reviewers' comments are sent to the paper's authors (anonymously).
8. The authors make the requested revisions. If the paper was accepted, the authors may generally make some minor revisions but is guaranteed publication; if the authors were asked to revise and resubmit, they make the significant changes required and must go through the peer review process again. The authors must also respond to reviewer comments where revision was recommended.
9. Reviewers are given a chance to reread the final versions of accepted papers or resubmissions to ensure that their concerns have been adequately met.
10. For resubmissions, the reviewers' comments are sent to the paper's authors (anonymously). Steps 8 and 9 are then repeated.
11. Editors make the final decision on papers. It is important to note that editors have the prerogative to overrule on any minor comments at this stage.

Four Components of a Review

As a reviewer, the majority of your job takes place in step 5. This is the heart of the peer review process, where you have the opportunity to respond to, question, raise issues with, or praise a paper. So how do you know what to look for and what kinds of comments to make? In general, there are four areas to look at carefully when reviewing a paper. We will briefly outline these here, but you will have plenty of opportunity to practice evaluating them later.

1. Methodology

The methodology of the paper is its backbone, the basis on which the authors' claims are being made. Whenever scientific claims are made, they *must* be supported by valid methodology. What you want to look for is: (a) a fit between the type of study and the methods, (b) methods that make clear what was done and why, and (c) an assurance that nothing important was overlooked.

In terms of fit, you should ask yourself whether the *question* being asked by the study can really be answered by the *type* of method being used. For example, if an author states in the introduction that they want to find out whether traffic jams increase blood pressure, it would not make sense for them to use a survey methodology. They would need to actually take people's blood pressure. On the other hand, if a study is attempting to determine whether a new staffing method is making people happier, a survey might be an appropriate methodology.

In addition, the methods should be presented in such a way that you can understand not only what was done, but *why*. Consider, for example, a study in which the authors say that they collected hospital data. What data were collected? For what purpose? Why did they specifically choose to collect this type of data? The answers to these questions should be clear.

You should also try to think about whether anything might have been missed. A famous example of this is a series of studies that supposedly showed that people who gained weight as they got older were healthier than those who were within the "normal" or "fit" weight range. However, it was later found

that the studies' methodologies overlooked something important: they forgot to control for smoking. Because smoking tends to reduce weight, the people with lower weights seemed to have more health problems—but these were actually related to smoking. Once smoking was controlled for, it turned out that gaining weight was not healthier than staying leaner. Take the time to evaluate each study's methods to see whether the authors might be missing a key issue.

2. Logic

Logic is the *connection* between a paper's data and its conclusions or claims. There must be a clear logical relationship between the specific measurements or observations (the data) and what the authors suggests those data are telling us. Consider the evidence that texting while driving is dangerous. If the researcher actually compared drivers who were otherwise similar, evaluating their number of crashes when texting or not texting, then the logic is very clear: drivers who texted had more accidents, and accidents are a sign of lower safety, so texting while driving is unsafe.

However, imagine if the researchers instead studied people in a lab. They gave the study participants cell phones, then had them play a complex video game. Some of the participants received multiple texts while playing, while the others did not. Those who received texts had lower scores in the game. As a result the authors claim that texting while driving is unsafe. A number of logical "steps" must be made in the paper for this to make sense. First, the authors must show that the video game is *like* driving in some way, perhaps in that it requires concentration or eye-hand coordination. Then, they must show that lower scores in the game reflect problems with the element of the game that is like driving. If they got lower scores just because they didn't spend as much total time playing, then it doesn't say much about driving. However, if they got lower scores because being distracted by texts led them to lose concentration, the connection to driving is clearer.

Similarly, the *type* of claim made by the authors must match the *type* of evidence collected. Imagine that an author conducted a survey and asked people whether they liked their jobs, giving them a "yes or no" answer option. If the results stated that 65% of the participants liked their jobs, that would make sense. However, if the results stated that most people don't like their jobs because they have bad bosses, that should raise questions. Did they ask about why people liked or didn't like their jobs? Was this even part of the survey? In this case, the authors are trying to use a yes/no methodology to answer a question that is too complex for a yes/no answer.

In general, be on the lookout for authors who are making claims that seem far removed from the content, type, or amount of data they collected.

3. Clarity

In a scientific paper, clarity has two parts: clarity of statement and clarity of concept. One of the reviewer's most important jobs is to help the authors achieve both.

Clarity of statement is what most people mean when they talk about clarity in writing; it refers to how well the writing itself conveys the authors' meaning. Although readers often don't know exactly how to say what is wrong, almost everyone notices when a piece of writing does not have this kind of clarity. Even if you can't provide specific details about how to fix the problem, noting that a particular phrase, sentence, or paragraph is unclear can be very helpful to the authors.

One of the most common reasons for lack of clarity in scientific writing is unnecessary complexity. Unfortunately, many people read scientific papers and believe that the reason they don't understand them is that the authors are "too smart" for them or that the paper is just too complicated for them to understand. Even scientific writing should be readable! If you think that a passage is unclear, it probably is. Don't assume that something you don't understand must simply be too complex for you. Note it in the review.

Clarity of concept is somewhat more complex—but equally important. Clarity of concept refers to how well the paper communicates the authors' overall ideas. Although it's not possible to read the author's mind, it is possible to know whether you are getting a clear picture of a key idea or not. Some questions you can ask yourself to figure out whether the paper is clear in concept are:

- When I finish the introduction, do I have some idea of where this study fits into the larger field and why the authors conducted it?
- After reading the research questions or objectives, do I understand what the authors specifically wanted to find out by doing this study?
- Does the methods section provide me with a sense of what the authors did in conducting the study and why those particular methods were used?
- When reading the results, can I understand and effectively interpret what observations were made, what data were collected, and how they answered the research questions or objectives?
- Do the tables and figures seem to be related to what is in the text?
- Does the discussion section give me a sense of the larger significance or importance of the study, and clear ramifications or implications of the study findings?
- Does the conclusion section provide the main take-home message and/or recommendation for future research?

If you can answer "yes" to all of these questions, the piece is very clear in its concept. If you had to answer "no" or "only sort of" to any of the questions, make a note in your review.

Remember that authors generally want their findings to be accepted by others in the field and generalizable in other settings, and this is only possible if readers can understand them. Helping them to clarify their work, both in statement and in concept, is a critical part of your work as a reviewer—even if you can't say for sure how to fix the problem.

4. Value

A paper's value is its importance to other researchers and/or people who actually work in the field being studied (practitioners). Much of your role as a reviewer is to make sure that a study is clearly and logically presented, but you should also note whether the topic and scope of the research are of inherent value, or interest, to potential readers.

For example, if a study provides evidence that a new method of identifying the highest priority, sickest patients is effective and may reduce under-triage, that study is critically important to emergency dispatchers and responders. A study showing that certain kinds of shift schedules are far more likely to cause stress and absenteeism is similarly of very great value to emergency dispatchers, administrators, and possibly even legislators.

This is an area in which you should definitely use your own judgment. If the study reports findings, or even simply poses questions, that are of strong interest to yourself and others in your line of work, the study most likely has value. After all, journals don't want to publish just any paper; they want to publish papers that will produce real-world improvements or suggest interesting directions for future studies.

Outcomes from the Review

Each reviewer reads the paper carefully and returns a list of concerns, issues, or questions to the editor who assigned the review to them. In many cases, the reviewer can also make a recommendation as to whether the journal should accept (publish) the paper. Usually, the reviewer can recommend that the paper be:

- Accepted as is (with no changes or a very few minor ones);
- Revised and resubmitted (if broader changes are needed but the reviewer still sees the research as basically well-conducted and valuable); or
- Rejected (if the paper does not fit the journal's focus, or if the study has serious flaws or problems).

Your recommendation should be supported by your evaluation of the methodology, logic, clarity, and value of the paper.

Good Review, Bad Review

As long as you take your time, read through the paper in detail, and look for the four elements listed above, you will be sure to cover all the bases in your review. However, there are some other critical measures that differentiate the good reviews from the bad. In this section, we will look at these and also discuss how to write useful, constructive comments.

Elements of a Good Review

Objectivity

The first and most important element of a good review is *objectivity*. To be objective means that you remain impartial in conducting your review, avoiding stereotypes, biases, conflicts of interest, and personal likes and dislikes. The word "partial" has the same word root as "partisan"; both refer to taking sides or allowing personal beliefs or desires to affect one's judgment. It may not be possible for humans to be completely impartial, but while reviewing, you should try to look at the data and the conclusions drawn from them without letting your own beliefs get in the way. This includes simply disagreeing with someone's findings or claims. If the claims are supported by clear, logically-supported, methodologically-sound data, then the paper has passed the requirements of peer review, whether you agree with its conclusions or not.

Conflict of interest

Second, a good review should also report any *conflicts of interest*. A person with a relationship to the author(s) of the paper, or who might stand to make money or receive any other benefit from the paper's acceptance or rejection, should not review that paper. If you believe, after seeing the paper,

that you might have a conflict of interest, you should return the paper to the editorial staff with an explanation of the conflict.

Focus on big picture

The third sign of a good review is that it focuses on the *big picture*, not nitpicking small errors or critiquing minor mistakes. Remember: the journal has its own editorial staff who will review the content for grammatical errors, typos, and misalignments in tables before the piece goes to print. Your job as a reviewer is to ensure that the journal does not publish work that uses unreliable methodology, or is unclear or illogical. It is the editorial staff's responsibility to "clean up" any small issues.

Writing Effective Comments

Naturally, it is not possible to know ahead of time exactly what comments you will need to write. The content of the comments will depend on the specifics of the paper. However, there are a few tips to remember that should help you phrase what you want to say.

Thought-provoking

First, remember that your job is primarily to *note* and *discuss*, not to *correct*. While it might be helpful to make specific correction comments regarding, for example, missing words or numbers that don't add up, most of your comments should bring up issues and allow the authors to decide what to do with them. This means that it is often useful to *pose questions*. For example, imagine that you review a paper in which the sample size seems quite small. An effective comment would note the issue and raise concerns using constructive language: "The sample size in this paper seems small. Could the authors perhaps address this in the limitations, or note in the methods section why the sample size is small or why a small sample is necessary/acceptable? Are there plans to conduct a larger follow-up study?" Notice that this comment brings the sample size issue to the authors' (and editors') attention without offering any specific correction.

Constructive

Also, keep in mind that comments should be *constructive*, not *destructive*. It is never appropriate to write that a paper is "bad," that the conclusions seem "stupid" or "mistaken," or that the authors should never have attempted to publish the paper. The purpose of peer reviewing for *AEDR* is for peers—that is, colleagues engaged together in a collaborative effort—to review each other's work to help ensure that emergency dispatch research meets a high scientific standard. This is a communal effort toward improvement of the field, not a competition.

Balanced

However, comments should also be clear about problems if they exist. A paper that has serious logical gaps, is unclear, or appears to be using a flawed methodology should not be approved for publication. Nonetheless, the reviewer might find some things in the paper to praise or approve, even while making suggestions and noting issues in other areas. For example, the reviewer might write, "This paper addresses a very important issue in emergency dispatching. However, it is a concern that the methods used do not directly support the conclusions being drawn. Specifically, the paper makes claims about patient outcomes, but it is not clear that any actual on-scene or hospital data has been collected." These

comments do not hold back in noting the reviewer's issues with the methodology, but the approach is even-handed and objective, and even offers praise where possible.

Impersonal language

Finally, you might have noticed that the examples of effective comments above often referred to *the paper* or *the methods*. In one case, the subject of the comment was "the sample size." This is intentional. Using the paper or the methods as the subject in your comments reduces the feeling that the author is being "attacked" and makes criticism easier to accept. The more your comments focus on the study and its findings—and the less they directly address the authors as people—the more useful your comments will be.

But I'm Not an Expert!

Many people feel that they may not be expert enough to provide effective peer reviews. Certainly, if you read a paper that has been assigned to you and feel that you cannot make useful comments, you should let the editorial staff know. However, there are several reasons why you should not be too concerned, beforehand, about your level of expertise.

Practical experience

The first reason is that you would not be selected to conduct a peer review unless the editorial staff felt that you had *some* kind of relevant and valuable expertise. Experience writing or reading scientific research is not the only kind of expertise that matters in a peer review. *In many cases, expertise in the field is just as important*. For example, if the editorial staff receives a paper relating to police dispatching, they will request at least one scientific reviewer to look at the methodology of the paper—but they will also request at least one police dispatch professional to provide feedback on the value and realism of the paper's claims. Often, illogical claims are caught by the reviewer who has actually practiced in the field, not the scientific reviewer. After all, the scientific reviewer may ask whether the data and conclusions presented by the authors match each other, but only someone who has "lived it" can say whether the data themselves seem to make sense and whether they will be of interest to others in the field.

Readability

Second, the reality is that most of the readers of *AEDR* are not researchers or experts themselves. Even in the most specialized scientific journals, most of the readers are not experts on the topic of each paper. As a result, it is very important that *non*-experts read each paper for clarity. Many researchers believe that they have to write in highly technical language to demonstrate their expertise or else they themselves have a hard time explaining their work in simpler terms. Non-expert readers provide the kind of feedback that helps these authors clarify their points, not only in the paper, but in their own minds.

Fresh perspective

Another reason that non-experts make valuable peer reviewers is that they often actually see things that experts don't see. Because they have been working in a single area for a long time, researchers can sometimes come to have specific assumptions or beliefs about that area. As a result, they may see

connections where they don't exist or miss findings that don't fit their expectations. For example, some studies have found that medical specialists tend to diagnose patients as having diseases in their own specialty far more often than other doctors do. Neurologists, in other words, may come to see every problem as a neurological problem, while oncologists begin to see everything as a potential cancer. Non-experts can be extremely valuable in breaking through these expectations and seeing, without assumptions, what is really there.

Example

Finally, even people with no knowledge in the field at all can often pick out logical inconsistencies, unclear language, and other problems not related to the specific data or findings of a paper. For example, consider the following two sentences: "We found that the number of mergansers per hectare was lower by 90% ($p<.05$) following the residential land reclamation initiative intervention than prior to it. As a result, we are recommending to the Board of Bird Studies that the intervention be continued in order to preserve the remaining merganser population."

Now, you might not know what a merganser is (it's a kind of duck), and you haven't been told what the "land reclamation initiative intervention" was. But you can already tell two things. First, this could be phrased a lot more clearly and simply. Second, the authors may have forgotten the word "not" in the second sentence. If the merganser population went *down* after the intervention, it should *not* be continued—at least not if "preserving the remaining population" is the goal! With no information about this study at all (since it is made up), you could still make valuable comments just by noting things that are unclear or don't make sense.

Remember that you will not be selected to review a study unless the editorial staff believe that you possess relevant experience and/or expertise and will be able to provide useful feedback. You always have the right, and the responsibility, to return a paper if you don't feel comfortable reviewing it, but that happens more rarely than you might think.

Conclusion

This course has provided you with the basic information you need to become an effective peer reviewer. However, the only way to really learn is to actually get involved and do a review yourself. In order to receive papers to review—and become part of the science of emergency dispatch—please email your name and a list of areas of expertise or experience to researchhelpdesk@emergencydispatch.org. We will contact you when we have papers in your interest areas to review.

Thank you for your participation. We look forward to working with you as a peer reviewer!