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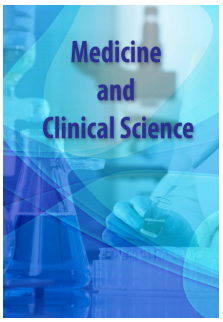
Opinion



Critical Reading of Scientific Articles: An Easy-to-Use Method for Graduates and Clinicians

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Abstract

Faced with an abundance of available literature, clinicians and graduates must follow an effective method for critical reading of scientific articles. This enables them to decide how relevant the selected article is to the issues specific to their area of work and to choose whether to undertake a basic critical reading or to embark on an active reading.

The substantial body of increasingly accessible literature makes it a daunting task even for the most experienced clinicians to become acquainted in some detail with the advancement of the science that they use to provide patient care. It is therefore a matter of being able to sort out, synthesize, and frequently update information and knowledge.

To do this, it is important to remain critical in reviewing the resources available on a given topic. The resources may vary in type, source, and scope. Therefore, after identifying references of potential interest, it is necessary to evaluate their nature as a preliminary stage that will guide subsequent reading and interpretation. This article proposes an approach to assist health care professionals in their critical reading of scientific literature. It is best to adopt this standardized strategy as you are developing your expertise in critical reading of scientific resources. As you become a more experienced critical reviewer, a personal method can be developed as long as it includes all the critical stages.

Preliminary stages

Determining the relevance of an article prior to more in-depth critical reading involves a number of steps.

Framing a question

Before starting the literature, search and reading, it is important to frame a question around the topic or concerns that require an answer. Oftentimes, there are several aspects to the chosen problem and they require the use of a number of different sources. Each of these should be approached with the question "What am I looking to find in this document?". This step is crucial, because the way an article is read will be determined by the answer sought (a method, a confirmation, guidelines, clarifying a controversy, and so on). Putting in writing expectations for each article consulted is helpful (Box 1).

Preliminary overview

Initial selection of an article should be based on its relevance to the question initially formulated. Faced with an abundance of literature, it is necessary to optimize information search efforts by selecting only articles that are likely to be of significant interest in relation to the topic explored.

First, you must identify the type of article: is it a primary source (research article) or a secondary source (literature review, commentary, or an article targeting the general public)? Words such as "research article," "original research," "review article," "minireview," and "commentary" are helpful in this regard. You can always analyse the paper's structure if such indications are lacking. A research article is built around five classic sections: abstract, introduction, method, findings, and discussion. Some journals accept that the Findings and Discussion sections be merged, other journals do not indicate section headings, but publish research articles. Literature reviews generally do not contain Method and Findings sections.

Secondly, you must analyse the title as it will reveal the overall idea of the article. Reading a title can be more complex than it might appear at first glance. Once you have read it a first time, you should give it more attention before deciding to move forward with that paper.

Additionnaly, consulting keywords is strategic. If this preliminary stage is well conducted, you may uncover the following information: the paper's relevance and the language level used (more or less specialized or accessible because familiar).

Preparation

If the previous stage has sparked interest but a certain discomfort remains as to the vocabulary or concepts used, it may be necessary to use a dictionary, a reference book, course notes, or any other document that may improve the understanding of the content in terms of terminology and concepts used.

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A critical overview of the abstract

At this stage, the paper's relevance and the level of ease with which it can be read are defined. A well written abstract covers the main sections of the article. For example, the abstract of a research article should include one or two sentences that set out the context of the study and the question addressed by the article (introduction). It should provide a brief description of the methods used to answer this question (method), an overview of the major results revealed in the course of the study (findings) and the authors' interpretation thereof (discussion), along with a conclusion. It is important to remember that a paper should not be cited based simply on reading its abstract.

Decision

Is the article relevant? Caution is required when deciding to discard an article at this stage. Sometimes, the authors' interpretation of their findings may be different from that of a clinician but the data could be readily used in a different context.

Basic critical reading

The "four corners": In addition to the text of the article, the frontispiece of the paper usually contains essential information found in the four corners of the page. The top left and right corners contain, for example, the name of the journal and the article publication date. These two key pieces of information provide perspective to the findings presented in the paper. Is it a renowned, peer-reviewed journal? Is the article recent (if not, it is possible that no significant study has been published on the subject since, in which case is should be read in consideration of this temporal limit).

In another corner of the page (usually bottom left), granting bodies are mentioned, where applicable. Sometimes, they are not presented on this page but they may appear in the acknowledgements. Is funding provided by peer committees, government bodies, or corporations that may have vested interests in the results?

The fourth corner provides information on the article authors, their respective fields of expertise, and their affiliations. Are they authority figures in their field (names may be unknown initially, but it is possible to find out if they are important authors by consulting the literature on a given subject)? Are they experts on the issue tackled in the paper? Are they employed by a recognized university or a private corporation?

Personal reconstruction

The idea here is to read the article and to form one's own judgment about its scope and conclusions. Using any function of highlighting, either manually or electronically, the abstract should be read a second time while analyzing form and content. Since often you will find a content that may be quite dense, it must be broken down. The author's summary provides a synthesis of roughly 200 words about the study that will provide enough substance helping the reader to reconstruct the full content of the paper.

In addition to the abstract, tables and figures presented in the article should also be studied. Along with their caption, these elements alone should lead to important discoveries. However, if the reader is not familiar with the subject, it may be necessary to refer to the text in the Method or Findings sections (in the case of research articles). In order to study a figure, the x-axis and y-axis must be identified. Likewise, column headings in tables should be noted. As for units of measure, the numerical value of the data presented must be evaluated and subsequently, patterns in the data can be identified. Following this assessment, the clinician can draw his or her own conclusions in regards to the study and compare them with the conclusions that the authors arrived at.

Major considerations to keep in mind

Other aspects may reveal important information. Expressions such as "in summary" and lists generally indicate the article's highlights and should be considered. The list of references and whether it seems exhaustive and up-to-date should also be examined. Are published data mentioned? Depending on how the article will be used, this step may prove to be sufficient to determine its overall relevance to your initial' expectations.

Active critical reading

After going through the preceding steps, with some confidence about the relevance and quality of the paper, the clinician can move to active reading. Active reading includes several other steps and does not focus on each sentence, but rather focuses on a general idea of the text.

Introduction

The introduction should provide basic information, such as the context, the importance of the topic addressed, the current state of knowledge, and the framework that guide the study. Answers must be found to the following questions: Do the authors know their topic thoroughly and have they taken into consideration prior research, in order to reflect the current level of knowledge in the area? Are the question or questions that are explored in the article, explicitly presented. Do the authors clearly position their study within the general knowledge context? Are hypotheses or theoretical propositions presented in the introduction? One way to ensure that the introduction has been understood is to answer the following questions: How recent is the latest research on the topic? Who is it attributed to? What are the assumptions of the article? In a nutshell, at this stage, the clinician should be able to easily draw a clear story about the information provided in the paper.

Method

At this stage, important information and less significant one should be clearly distinguished in terms of method and information. In this sense, one should pay attention to following elements: the population, the sample, the research design, and the analysis methods. It is important not to overlook this section because it allows to, among other things, assess the validity and relevance of the conclusions drawn. In other words, is the capacity of the methodology to provide answers to the research questions established. Reading every word and trying to grasp all subtleties may not be necessary. In addition, it may be useful to consult other articles in order to understand certain aspects that seems to emerge as significant. The method must lead the clinician to the chosen experiences that the authors carried out. An ontological, epistemological and empirical coherence must reveal itself at this point.

Findings

The findings section presents the results obtained following the use of the data justified in the introduction and outlined in the Method section. According to some, this is the most important part of an article. Although it is often dry (containing a description of the relevant research data), a detailed analysis must be undertaken. In order to appreciate it to its full potential, it may be useful to go back and forth between this section and the Method section. This will allow to make sense of the data into its context. At this stage, it should be possible for the clinician to 1) Identify what results the authors have arrived at, walking through their study methodology and 2) Get a general idea of the conclusions that can be drawn from the study.

Discussion

In the discussion section, the authors outline the reasons why they believe they obtained the presented findings. They interpret their data, by comparing and contrasting it to the reviewed literature and to the goal of their study. Knowing that authors may have interests that may differ from the clinician's, it is important not to overlook the Findings section on the grounds that it is too complex. In addition, some authors may extend further the generalizations that would generally be drawn at the outset, from the results. Conversely, findings are sometimes interpreted in a novel way that had escaped the authors.

Reflection and rereading

At this stage, it is possible to create an overview, mentally, of the information provided by the article. It is not unusual to also feel the need for clarification, in which case, it is necessary to read the article again. The idea is to focus on specific elements that may have been overseen during the first reading. Finally, with all the information at hand, some data that may have been judged unnecessarily detailed at first may now appear more comprehensible.

BOX 1

Recommendations and Practical Considerations
Cost effectiveness: Not all articles require a comprehensive analysis such as the one presented here. Before deconstructing an article, it is necessary to evaluate whether putting in the required time is worthwhile. The length, relevance, importance, degree of precision, and complexity of the text should be taken into consideration.
Specialized terminology: Research articles are often written in a specialized language that may make them difficult to read. A "good" journal article, providing definitions and explanations of the terms used may prove to be a useful tool in such situations.
Degree of understanding: Even experts need several readings in order to fully grasp the substance of some articles. Rereading is neither unusual nor embarrassing. However, it is possible that after a second reading, an article remains unclear. This may be because the prerequisites to grasping its content are lacking, excessively complex, or intrinsically incomprehensible.
Annotations: Using the classic question mark, exclamation mark, and "x" for errors in the text, as well as underlining important facts are all good ways to situate oneself in an article and facilitate analysis and subsequent reference.
Categorization: Finally, there is a range of reference management software on the market (EndNote® and ProCite®, for example). They help to manage citations, import them automatically into text, and generate reference lists as needed.