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Various Types of Scientific Articles

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37.1 Introduction

What characterizes an article as scientific? Is it the subject matter, the approach used to research and gather content, the style of writing, the manuscript structure (i.e. IMRAD – Introduction, Materials and Methods, Results, and Discussion), or the process of being peer-reviewed? Perhaps it has to do with the nature of the publication (i.e. a peer-reviewed medical journal or an open-access publication)? There are in fact many types of articles that are considered scientific.

That said, it is useful for authors to understand the various kinds of scientific articles and their nuances before approaching the writing process. Ideally, authors should tailor their writing to fit the most appropriate article category so as to optimize their research reception and enhance their chances of publishing (Peh and Ng 2008).

There are numerous types of articles to be found in scientific journals, all of which contribute to the individual journal's scope (Table 37.1). Information on the format, style, and purpose of each type of article are usually detailed in a journal's instructions to authors or author guidelines. In this chapter, we will provide an overview of the major types of scientific articles. Our goal is to guide medical students, residents, and young researchers in selecting the most appropriate manner of communicating scientific material.

37.2 Primary or Original-Research Articles

Primary or original-research articles communicate knowledge arrived at or discovered by the author(s). They include theoretical articles, which present new or established abstract principles (e.g. mathematical modeling of biological and physiological processes), as well as observational and experimental research. Primary articles may be in the form of a short report, focusing on a single case, or in the form of a case series, presenting a series of cases encountered over a limited period of time. They may report

Table 37.1 Types of scientific articles.

Major type	Examples
Primary or original research articles	Randomized controlled trial Clinical trial Before-and-after study Cohort study Case-control study Cross-sectional survey Diagnostic test assessment Case report/case series Technical note
Secondary or review articles	Narrative review article Systematic review Meta-analysis
Special articles	Letters/correspondence Short communications Editorials/opinion Commentaries Pictorial essay Other special categories
Tertiary literature	Textbooks, handbooks, manuals Trade or professional publication articles Encyclopedias
Gray literature	Conference proceedings, posters, abstracts Government reports For-profit and nonprofit organization reports online forums Blogs, microblogs, tweetchats, and other social media

on clinical procedures, diagnostic, or therapeutic. Technical reports, including the evaluation of equipment, instrumentation, and technology, belong in this category. Original theses and dissertations are also counted among primary-research articles.

The original article is the most important type of scientific paper; it provides unique information based on an original-research design. The articles can be descriptive or analytical in nature, and report on studies that are retrospective (examining past outcomes) or prospective (looking for new outcomes). The format of the body of an original article usually follows the IMRAD structure. A structured abstract usually precedes the article. Examples include randomized controlled clinical trials, before-and-after studies, cohort studies, case-control studies, cross-sectional surveys, and diagnostic test assessments (see Table 37.1).

A case report describes a single study, documenting unique features discovered during the research process. Notable features can include previously unreported observations of a known disease; the unique use of imaging or diagnostic testing to reveal a disease; or an undocumented clinical condition, treatment, or complication. Case reports are

usually short and focused with a limited number of figures and references. Their format generally includes a short abstract (or none at all), a brief introduction, an account of the case study, and a discussion giving context to the research findings. If relevant, a limited review of the literature might be included in a case report.

A technical note, or technical innovation, is an article describing surgical or medical techniques or procedures; new devices or technologies, including instrumentation and equipment; or modifications of existing techniques, procedures, devices, or technologies. The discussion is usually narrowed to a specific message, and there is often a prescribed limit to the number of figures and references. A technical note might be a condensed version of a more comprehensive intellectual property (IP) application or patent application. Technical notes usually consist of a short, unstructured abstract (or none at all), brief introduction, methods, results, and discussion. The methods and results sections can be combined under the heading of technique.

37.3 Secondary or Review Articles

Secondary or review articles expand on knowledge that has been previously communicated by others. That includes revisiting, reviewing, analyzing, or synthesizing existing research, and presenting it in a new light. Secondary articles might come in the form of a monograph (a detailed study of a single subject or aspect of a subject), a descriptive review, or commentary.

A narrative review article is an authoritative and comprehensive analysis of a specific topic that is more descriptive in nature than a systematic review. It does not introduce new data, but often leads to formulation of new hypotheses. A narrative review can include an unstructured abstract, an introduction that gives a detailed background of the topic, a body of content organized under subheadings, and a summary and conclusion with a large number of peer-reviewed references. Because narrative reviews are often solicited by the editors of a journal, they are sometimes referred to as “invited reviews.”

Systematic reviews typically belong in the category of secondary articles as well. Although it could be argued that if new knowledge is arrived at in the process of conducting the analysis, it might qualify such reviews as original articles. Systematic reviews are usually characterized as either qualitative or quantitative (using meta-analysis), and attempt to reduce bias by addressing the methodological selection, assessing the quality of the study (critical appraisal), and analyzing the literature. A systematic review article includes an introduction, a description of the methodology employed in the review process, and the systematic presentation and synthesis of the findings. For additional information on systematic reviews and meta-analyses, see Chapters 67–68.

37.4 Special Articles

Other types of scientific articles include letters to the editor, correspondences, and short communications that might be primary or secondary in nature. Editorials, opinion articles, commentary, and perspective articles traditionally express the opinion and point of view of the author(s).

Letters and correspondences are usually short and can be written on any topic of interest to the journal reader, including feedback on previously published articles. These should be objective and constructive, and supported by a limited number of references. When a previously published article is the subject of a letter, the editor usually invites the author of the original article to submit a written response (author's reply to letter), which is published side-by-side with the letter to the editor. Letters can also be used to float new hypotheses and to draw readers' attention to important issues affecting clinical practices. In fact, the initial publication of the double-helical structure of DNA by Watson and Crick (1953) was a letter to the editor published in *Nature*.

Short scientific communications are usually quick synopses of preliminary results or initial research findings that are not yet ready for full presentation. Such communications are beneficial as they may stimulate discussion leading to additional insights and collaborative work. They can include both larger case series and small sample studies.

Editorials most often take the form of a short review or critique of an original article accepted for publication in the same journal issue. An editorial typically consists of a brief description of a subject that does not warrant full review, or is a follow-up to recent innovations or topics of interest to the journal readers. Editorials are so termed because they are usually written or assigned by the journal's editor.

Commentaries are short articles that describe an author's personal experience with a specific topic. The subject might be controversial and provides other existing viewpoints before presenting the author's perspective. Commentaries might be based on a current hot topic or commissioned by a journal to accompany an original paper on the same topic. Unlike a review article, the number of references and illustrations are limited to support the author's opinion. Commentaries usually include an unstructured abstract (or none at all), introduction, and content organized by subheadings.

A pictorial essay is a special type of teaching article that relies on quality visuals to communicate a current trend or message that is educational in nature. The text is limited in favor of many figures, with much of the message contained in the figure legends and captions. Emphasis is placed on the teaching value of the article, and the format can include an unstructured abstract (or none at all), a brief introduction, optional subheadings and discussion, and limited references.

Other categories of articles exist, which are usually meant to complement the mission and style of the individual journal contributing to the journal's character.

37.5 Tertiary Literature

Trade-publication articles, textbooks, handbooks, manuals, and encyclopedias comprise what is called tertiary literature. These build on knowledge that has been around for a long period of time and incorporate the secondary literature. In turn, tertiary literature may be used to synthesize primary literature.

37.6 Gray Literature

These are documents issued by research institutes, universities, government agencies, international, national and local authorities, or industrial firms outside of the

traditional academic publishing and distribution channels (Feather and Sturges 2003). Conference proceedings, poster presentations, and abstracts are some examples that are not included in the formal categories of scientific literature previously discussed. Strictly speaking, they are not fully accepted as scientific papers. Hence, the term gray literature.

37.7 Conclusions

For authors, being familiar with the various types of scientific articles is part and parcel of the academic career. Authors should know the purpose and requirements for each article type, and submit their work in the most appropriate category in order to maximize their chances of getting published and viewed.

The future of scientific articles and their classifications remain to be seen. Our transition from the Gutenberg era to the age of electronic publishing is not the end of the story; it marks a new beginning of exciting and innovative forms and types of academic communication. The division between the traditional and newer forms of scientific publication is further blurred with future multistage open-review systems that allow public discussion and critique of initially published articles, which are accordingly revised until a “final” version is eventually published (Pöschl 2012).

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