

# Mastering Scientific and Medical Writing

A Self-help Guide

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## 2 | GOOD VERSUS POOR SCIENTIFIC WRITING: AN ORIENTATION

“Everything that can be thought at all  
can be thought clearly.

Everything that can be said  
can be said clearly.”

*Ludwig Wittgenstein*

### 2.1 | WHAT IS “GOOD” SCIENTIFIC WRITING?

When we declare that a certain text is better than another, we rely on a scale of values, with “good” at one end, and “poor” at the other.

But who sets the standards for “good” and “poor” scientific writing? Who is the ultimate judge? Who censors the quality of our scientific texts? While general opinion of what is “correct” may be divided, there are certain bodies or sources that we usually accept as authorities. These include:

- dictionaries
- grammarians, linguists, editors, teachers
- scientific community
- set traditions and accepted trends.

Nevertheless, even experts may disagree among themselves. I have seen groups of learned scientists brooding over a paper, in an attempt to decide whether the paper is well written or not. Opinions often clash, and precious time may be lost because of unnecessary arguments over issues of style that may not affect the clarity of the message.

The ultimate judgment of the quality of our scientific writing efforts lies with the readers themselves. If the learned reader follows our train of thought and understands our message, then the writing has fulfilled its primary purpose.

Nonetheless, we have conventions to follow, guidelines to adhere to, and trends to observe. The changes and trends we have seen over the years could

almost be called evolutionary. Many of the rules for good scientific writing valid 10 or 20 years ago have been modified, undone, or even reversed during subsequent years (for example, see 5.2, Active versus Passive Voice).

When evaluating the “power” of a scientific manuscript – your own or some other author’s – you may find it helpful to consult the document standards listed below:

**Table 2.1** Document Standards

STANDARD	DESCRIPTION
<i>Purpose</i>	<i>The purpose of the manuscript must be obvious and unambiguous.</i>
<i>Conformity</i>	<i>Text has to conform to given formats, e.g., for health authorities, marketing, journals, books etc.</i>
<i>Accuracy</i>	<i>The wording must be grammatically correct, concise, accurate, and precise.</i>
<i>Consistency</i>	<i>Terminology should be consistent and appropriate.</i>
<i>Logic and flow</i>	<i>The manuscript should be a “story” with a clear message based on a logical train of thought.</i>
<i>Context</i>	<i>The “story” must be presented in the context of established literature or other reported work, and must be congruent with accepted institutional or regulatory values.</i>
<i>Structure</i>	<i>A logical structure (i.e., headings and subheadings, paragraphs, figures, and tables) should be chosen.</i>
<i>Data presentation</i>	<i>High-quality data should be presented clearly, using tables and figures as appropriate.</i>

2.2 | THE PLAIN LANGUAGE MOVEMENT

Joanne Locke, Senior Policy Advisor and Plain Language Coordinator at the U.S. Food and Drug Administration (FDA), reviewed an initiative termed “The Plain Language Movement” (American Medical Writers Association [AMWA] Journal, Vol. 18, [1], 2003). The movement dates back to the 1970s when the U.S. federal government began encouraging its regulation writers to be less bureaucratic.

The plain language movement is an attempt to demonstrate the benefits of writing clearly and concisely, in a reader-focused style. In short, the plain language movement may be called a recipe to use

- logical organization of your text,
- common, everyday words (except for necessary technical terms),
- “we” and other personal pronouns,
- the active voice, and
- short sentences.

People who use documents written in plain language can quickly and easily find what they need, understand what they find, and act on that understanding.

Many scientists believe that they have to write only for colleagues or experts in their own field. An effort to re-assess one’s own writing style is usually only made after realizing that readers are overwhelmed, overloaded, and too busy to wade through dense writing. Floyd Bloom, MD, former editor of *Science*, has described the attempt to absorb the onslaught of new scientific data as “... like trying to drink from a fire hose. In our bright, new data-packed world, finding the highlights approaches on being an absolute requirement.” (Written communication, March 30, 2002).

Experience proves, however, that scientists are increasingly aware that their journal submissions must adhere to the “Instructions for Authors” of the chosen journal, and some of these clearly encourage plain language:

- In its “Instructions for Authors,” the *Journal of the American Medical Association* states, “Manuscripts should meet the following criteria: ... writing is clear ... conclusions are reasonable and supported by the data, information is important.”
- On its Web site (<http://www.bmj.com>), the *British Medical Journal* states, “Please write in a clear, direct, and active style. Write in the active [voice] and use the first person where necessary. Try to avoid long sentences that have several embedded clauses.”

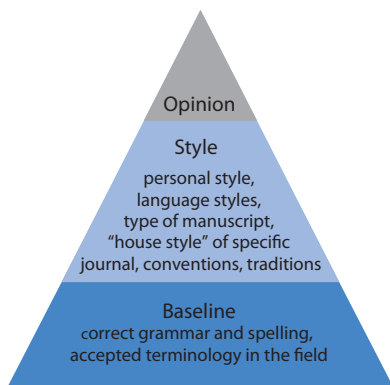
Many biomedical communicators would benefit from expanding their reading audience, and they might be surprised how easily this can be achieved. Without

any doubt, more medical and scientific breakthroughs will be realized if those additional readers are enlightened or inspired by clear, understandable articles. Moreover, scientists who reach a wider audience might be more successful in persuading policymakers to fund their research. Grant applications written plainly and clearly probably stand a better chance of being funded, assuming, of course, they are worth funding.

! Biomedical communicators and scientific writers do not need to “dumb down” scientific writing or omit technical terms to write plainly and clearly. However, they do need to define or explain terms that their audiences may not recognize. They also need to write logically, building from what information the reader knows to what new information the reader will learn in the article.

### 2.3 | THE BASO PYRAMID OF SCIENTIFIC WRITING

As a teacher of scientific writing, I like to use a visual model – a model I have termed the BASO pyramid (an acronym formed from the first letter(s) of **B**aseline, **S**tyle, and **O**pinion) – to illustrate the various levels of language in science.



### 2.3.1 | BASELINE

Clearly, adherence to the rules of grammar and spelling, as well as the use of the appropriate terminology in the relevant scientific field, must be considered “baseline.” In other words, we owe it to the ethics of writing to observe the fundamentals of proper communication, particularly if we communicate in writing. Misspelled words not only confuse – they often annoy the readers to the extent they no longer wish to read the full text. Moreover, poor grammar and erroneous use of technical or scientific terms will jeopardize the credibility of the results. By extrapolation, it is our credibility as scientists that is at stake.

### 2.3.2 | STYLE

The second level of the BASO pyramid is “style.” On this level of writing, we have a certain degree of flexibility in that we do, of course, have the right to express ourselves individually, as long as the style we use is compatible with the appropriate guidelines or conventions.

The chosen language inevitably influences the style of scientific writing we use. For example, there are certain differences between American and British usage of English (see also 3.2, Consistent Spelling: American English versus British English). In addition, the type of report or communication we work on will dictate the chosen style to a certain extent. If we draft a manuscript for publication, the style of writing must be in line with the “house style” of the target journal (see also 5.5, The “House Style” of Journals).

Most journals provide some information for authors with respect to the style and structuring of the manuscript intended for submission. Some journals are more specific than others about the style they wish authors to use. Many current journals refer to the *Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication*. This guideline was initially drawn up by a small group of editors of general medical journals in 1978. Because the group had met informally in Vancouver, British Columbia, they became known as the Vancouver Group (see also 9.2, Reference Formats and the Uniform Requirements). Journals

that agree to use the *Uniform Requirements* (over 500 do so) are asked to cite the current version of the guidelines in their instructions for authors.

Finally, company-internal conventions or traditions may sometimes influence the style of our scientific writing (see also 5.6, Company-Internal Conventions of Style and Format). Nowadays, many international pharmaceutical companies use templates for research reports and other documents to ensure homogenous styles and formats across departments and groups. Such style conventions may not necessarily be in full compliance with the generally accepted principles of good scientific writing, but the company staff would be expected to adhere to them. For example, one company may opt for a noncapitalized heading style in their documents, while another may encourage the use of capitals in all titles throughout a report (see also 3.6.3, Capitals in Titles).

### 2.3.3 | OPINION

The tip of the BASO pyramid I have termed “opinion.” It is important to realize that there is, in fact, room for personal opinion even in the context of scientific writing. This implies that certain issues are not simply “correct” or “incorrect.” A particular word may be preferred over another, but the less preferable term may not be wrong as such.

Let us consider the following sentences:

- In this study, we took blood samples immediately *before* starting the infusion.
- In this study, we took blood samples immediately *prior to* starting the infusion.

Is “before” or “prior to” correct here? Clearly, both terms are correct, and the choice solely depends on your personal preference. American writers may go for “prior to,” while European writers may favor the more commonly used “before.” The same applies to terms such as “following” and “after.” Again, the

two terms can be used interchangeably in principle, but my advice is to use “after” instead of “following” for two reasons, i.e., the term “after” is shorter, and “following” is used far too often in scientific writing because of its various meanings.

In conclusion, we should always keep in mind that excessive arguments about the “rights” and “wrongs” of scientific writing is a poor investment of precious time, especially if the issue is simply a question of personal opinion.

## 2.4 | COMMON MYTHS AND MISCONCEPTIONS

### 2.4.1 | WHAT ARE MYTHS AND MISCONCEPTIONS?

Can we speak of “common misconceptions” in a field as broad and diverse as scientific writing? Is it really possible to find general myths among scientific communicators worldwide who are, inevitably, of many different language origins? The answer is yes; we do find a trend towards general misconceptions that seem to have been passed on by way of tradition in many an institution all over the world. On top of the “generic” misconceptions we see in the scientific and medical literature, there are the more specific difficulties arising from the confusion between different languages, such as German and English.

Here are the most frequent shortcomings of scientific texts resulting from myths and misconceptions:

- long and complicated sentences instead of short, clear sentences (Germanic strings of words)
- mixing creative and scientific writing
- scientific “story” not readily apparent
- poor structuring of text
- mixing actual results and their discussion
- inconsistent use of technical terms and units
- misusing or wasting specific and generic terms
- reluctance to use first-person pronouns and overuse of passive voice
- tendency to turn sharp and powerful verbs into weighty nouns



Let us consider some of these aspects in more detail:

### 2.4.2 | LONG AND COMPLICATED SENTENCES

Unnecessary words or superfluous decoration make it difficult for the reader to grasp the key message. Although current guidelines consistently stress the importance of brevity in scientific reporting, the myth that quantity comes before quality has not yet been eliminated completely.

The temptation to use ample decoration also comes from the mixing of creative and scientific writing (see also 5.4, Limiting Modifiers and Other Decorative Words). Many scientific authors hold a firm belief that sentences crowded with information add value to their scientific message, and yet they achieve the opposite. Although this problem is evident across the entire scientific literature, it is clearly more pronounced among authors with a language background other than English, for example, German or French. I have termed this phenomenon the “Thomas Mann urge,” i.e., the urge to be more colorful and flowery than is useful in scientific reporting.

Consider this sentence:

- The potentially superior antiplaque and better surface-active properties of amine fluoride and stannous fluoride containing mouth rinses were carefully investigated in a well-designed double-blind, crossover study in 10 healthy volunteers.

Even the learned reader needs considerable time to digest the information contained in this sentence. Why not simply say:

- We investigated the antiplaque and surface-active properties of mouth rinses containing amine fluoride and stannous fluoride in a double-blind, crossover study in 10 healthy volunteers.

- ! Quantity can never replace quality of our scientific message, nor can it mask any vagueness we may have as a result of an incomplete understanding of the concepts.

### 2.4.3 | MISUSING OR WASTING SPECIFIC AND GENERIC TERMS

Misuse or waste of specific and generic terms gets in the way of effective communication. Consider this sentence:

- The response of a variety of new antifungal agents is described in the section below.

The sentence implies that it is the “variety” that shows a response, while, in fact, we clearly mean the “antifungal agents.” Such collective nouns are best deleted or replaced by an adjective, such as “many” (see also Appendix 10.4, Awkward Phrases to Avoid).

### 2.4.4 | RELUCTANCE TO USE FIRST-PERSON PRONOUNS AND OVERUSE OF PASSIVE VOICE

Reluctance to use first-person pronouns and the resulting overuse of the passive voice cause much debate among scientific communicators. Because the issue is of considerable importance, I have dedicated a full section to it (see 5.2, Active versus Passive Voice). Here, I just want to stress the need to reconsider the traditional style of passive reporting, and to accept the fact that nowadays the active voice is clearly preferred. Active statements are invariably shorter and help avoid unnecessary guessing as to who is responsible for the work reported.

### 2.4.5 | TENDENCY TO TURN SHARP AND POWERFUL VERBS INTO WEIGHTY NOUNS

Why do we so often use bulky nouns when a sleek and elegant verb would do a much better job? Words commonly used as the noun rather than the verb include examination, analysis, investigation, study, and performance, among many others. Why would anyone prefer this?

- The investigation of the cytochrome P450-dependent drug metabolism was carried out using a microsomal preparation.

Surely, the sentence below is more graceful:

- We investigated the cytochrome P450-dependent drug metabolism in a microsomal preparation.

Not only do we get rid of a greatly overused (and sometimes abused) noun (investigation); we also make the sentence active by using the personal pronoun “we.”