

Getting what you want from your scientific writing: tips for writing clearly

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Abstract

Good medical writing is like good writing in any discipline: the writer should explain complex concepts and ideas clearly and accurately and engage the reader. In this article, I provide four suggestions to help clarify writing on complex subjects: avoiding nominalizations, using language precisely, using parallel construction, and placing information where readers expect to find it. Applying these principles to science and medical writing can help readers understand difficult concepts more easily the first time they read your document.

Keywords: Parallel construction, Clear writing, Nominalisations, Plain language

Introduction

Good medical writing is like good writing in any discipline: the writing communicates an idea or concept to the reader in a clear fashion. A science or medical writer should not try to sound smart or elitist by using vague verbs and abstract nouns that make the reader search for meaning. Instead, the writer should explain complex concepts and ideas clearly and accurately and engage the reader.

The writing can be evaluated by the reader's response. Did the target reader understand and remember the message? Did the reader follow the instructions successfully or make the necessary decision? Did the reader do what you wanted (i.e. take medication properly or fund a grant)?

In this article, I present four suggestions for improving writing. These techniques help to improve clarity so that your readers can more easily understand the message the first time they read your work.

Avoid nominalisations. Rescue the verb!

When I wrote for my courses in college and graduate school, my target audience was my professor,

and I wrote to impress. To sound 'smart' I nominalised verbs and used passive voice and as much jargon as possible.

The problem with writing to sound smart is that I would often create sentences that required the reader to perform a great deal of mental gymnastics. That is, I made my reader work too hard to understand my writing. Complex subject matter does not require impenetrable writing. Scientific and medical information can be communicated both clearly and accurately. Now when I write, I strive to create clear sentences that convey the message on the FIRST read. To this end, one of the first things I do after writing an initial draft is look for nominalizations.

Nominalisations are nouns made from verbs. They dominate scholarly writing, and they are often associated with awkward passive constructions. In English, you can recognize many nominalisations by looking for words ending in '-tion' or '-ment', although not all nominalized words take these forms. Looking at the nominalisations in a sentence and 'rescuing' the verbs can help to make writing more understandable.

Consider the following:

Draft sentence: 'Often, the challenge is selection of the best assay for inclusion into the secondary screening programme.'

'Selection' and 'inclusion' are both nouns created from verbs.

Suggested rewrite: 'Often, the challenge is selecting the best assay to include in the secondary screening programme.'

Draft sentence: 'Indeed a major impediment to the interpretability of microarray data is the current lack of comparability from laboratory to laboratory, resulting in the inability to independently verify published data.'

The verbs 'interpret' and 'compare' are almost screaming 'Rescue Me!'

Suggested rewrite: 'Because microarray data from different laboratories often cannot be compared

directly, independently verifying published micro-array data is difficult.’

Use language precisely, use language that you understand, and proofread

A friend of mine told me about an incident that happened during a speech-crafting workshop for professionals. One of the members was given the task of selecting a word to introduce and define for the group. The other members of the group were supposed to incorporate that word into their conversation during the workshop.

The word selected was ‘enervate’, and the presenter defined it as meaning ‘to energise or excite’. Although several people at the workshop knew that ‘enervate’ means ‘to destroy or weaken’, nobody corrected the presenter because nobody could figure out how to do it tactfully. As a result, workshop participants were blithely inserting ‘enervate’ into their conversation during the workshop, describing how a vacation or interactions with their children enervated them.

I can’t help but smile when I envision these accomplished professionals in this speech workshop becoming so ‘enervated’, but what happens if one of those professionals writes a follow-up note after a job interview and describes the interview as being an enervating experience?

When you write (or speak), avoid the temptation to open a thesaurus and use the synonym with the most syllables. Instead, be precise with your language.

If you are writing on a subject out of your area of expertise, go over your text with someone who knows the subject to ensure that you use the terminology correctly.

Proofread, even if you are an expert in the field and know what you are trying to say. Read, reread, and have someone else proofread your work. Often what we write doesn’t always communicate what we intend.

Consider these examples:

Draft sentence: Initially, the transformed *E. coli* were **reticent** to express the seven-pass transmembrane protein.

Who knew that bacteria were capable of self-awareness and reflection? ‘Reluctant’ won’t work here either.

Suggested rewrite: ‘Initially, the seven-pass transmembrane protein could not be expressed in *E. coli*.’

Draft sentence: Multiplexed assays were used to **hone** in on mitochondria that were shut down by drug treatment.

Suggested rewrite: Multiplexed assays were used to **hone** in on mitochondria that were shut down by drug treatment.

Draft sentence: As part of the wellness initiative, the company offers a free employee assistance programme, which provides eligible members and their families with marriage, family, and relationship problems; alcohol and drug abuse problems; and emotional, personal, and stress-related problems.

The material here is not complicated, and I suspect the writer knew what she meant. However, did she really mean to say that the assistance programme provides employees with problems? In this case, clarity and accuracy are improved when you divide the material into two sentences and eliminate the ‘problems’.

Suggested rewrite: As part of the wellness initiative, the company offers a free employee assistance programme. This assistance programme provides eligible members and their families with marriage, family, and relationship counselling, alcohol and drug abuse treatment, and emotional, personal, and stress-related assistance.

Guide your reader with parallel construction

Items and ideas of equal importance should be presented using equivalent grammatical structures, as ‘**parallel constructions**’. If two or more ideas or items are connected by a coordinating conjunction such as ‘and’, ‘but’, or ‘or’, then those ideas should be expressed in parallel or equivalent grammatical constructs. Items in a list should be parallel. This includes all verbal phrases, all nouns, etc. Parallel construction guides your reader and helps your reader organize concepts and see relationships quickly.

Consider this list of writing tips:

- Know your audience.
- Read and follow the instructions to authors.
- Use, but do not trust, spell-check programs.
- Avoid unnecessary passive voice.
- Use parallel structure.
- Provide context for new ideas.
- Proofread and review your work.

Each of the items in this list is a complete thought written in the imperative voice. The items in the list are parallel. The uniform structure allows the reader to focus on the content of each writing tip, rather than trying to sort the tips into categories or groups. The parallelism has done the sorting for the reader.

Parallel structure is important for sentences too, particularly long ones.

Consider these examples.

Draft sentence: ‘Medical writing ranges from editing patient education materials, physician EMR help manual writing, to creating clinical research protocols, to writing of pharmaceutical information sheets and other treatment and therapy pertaining instructions’.

This sentence contains several items, presumably all of equal importance, yet they are presented in a variety of grammatical constructs. The reader has to strain to figure out what the writer is saying.

Suggested rewrite: ‘Medical writing involves editing and writing many kinds of documents including online help files for EMR software, clinical research protocols, pharmaceutical information sheets, and patient-directed materials.’

Draft sentence: ‘The protocol is both a long procedure and very tedious’.

Suggested rewrite: ‘The protocol is long and tedious’.

Parallel structure can guide your reader, providing clues to equivalent ideas by putting them in equivalent grammatical constructions. Using parallel constructs aids in the rhythm and flow of your writing, and will help your writing be clearer.

Place information where your reader expects it

Your writing will be more easily understood if you place the information where your readers expect to find it. Western readers read from left to right, and readers expect old material, which provides context, on the left. The new material is on the right. Use this information as a guide when building tables and graphs to present data. Put the ‘known’ (old) material that provides the context for your reader on the left and the ‘unknown’ (new) material on the right (Table 1).

In this table, the known information, the amount of material you started with, is on the left and the unknown information, how much DNA was isolated, is to the right.

Table 1: Yield of genomic DNA from different starting amounts of leaf tissue (mean ± SD)

Starting amount (mg)	Arabidopsis (µg)	Maize (µg)
40	8.33 (±1.15)	7.67 (±0.58)
100	43.33 (±2.52)	40.67 (±6.66)
150	49.83 (±1.04)	47.17 (±2.75)
250	59.67 (±7.57)	60.00 (±4.00)

In the topic position of a sentence, your reader will expect context and ‘old’ information. The reader needs perspective. The topic positions in a string of related sentences should be consistent to guide the reader through the paragraph or section.

A reader also expects a sentence or paragraph to be about whatever shows up first. For instance, if you are writing about the mechanism of action of antidepressants, don’t begin by talking about beta blockers (unless you can make a really strong connection between the two that uses sensible transitions and related topic strings).

The ‘stress’ position comes at the end of a sentence, and readers will naturally remember and emphasize the information that appears in the stress position. If you start with the exciting material at the beginning of the sentence but have a so-so ending, you can lose your writing momentum.

For the most effective endings, shift the less important, less exciting information to the ‘left’ (or the beginning of the sentence). Also, when you edit, look at the endings of your sentences, see if you can trim them to give them more punch.

Consider the following example:

Draft Sentence: Sociobiologists are making the provocative claim that our genes largely determine our social behaviour in the way we act in situations we find around us every day.

Suggested Rewrite: Sociobiologists are making the provocative claim that our genes largely determine our social behaviour.

When you introduce a technical term for the first time – or even a familiar but important term – design the sentence so that the term appears at the end, in the stress position. Your reader is more likely to take note of the term if you do.

In English, the typical sentence order that a reader expects is: Subject–Verb–Object. So, keep these parts of the sentence as close together as possible. Avoid interrupting the subject and verb or verb and object with long phrases or unnecessary information.

Draft sentence: A critical gene that serves as a beacon and gives cells a much needed sense of direction in the chaotic days of early development has been identified by HHMI researchers.

By the time the reader makes it to the end of the sentence, she has forgotten what has been identified.

So, keep the subject (gene), verb (has been identified) as close together as possible for a stronger sentence. Better yet, remove the passive voice and use a subject–verb–object structure.

Suggested rewrite: HHMI researchers have identified a critical gene that serves as a beacon, giving cells a much needed sense of direction during early development.

Draft sentence: The neurotrophins, including nerve growth factor (NGF), brain-derived neurotrophic factor (BDNF), neurotrophin-3 (NT-3) and neurotrophin-4/5 (NT-4/5) are a family of related polypeptides which regulate the survival and differentiation of discrete, and sometimes overlapping, neuronal populations.

Suggestion: The neurotrophins are a family of related polypeptides that regulate the survival and differentiation of discrete, and sometimes overlapping, neuronal populations and include nerve growth factor (NGF), brain-derived neurotrophic factor (BDNF), neurotrophin-3 (NT-3) and neurotrophin-4/5 (NT-4/5).

Even better: Survival and differentiation of neuronal populations is regulated by a family of related polypeptides that includes nerve growth factor (NGF), brain-derived neurotrophic factor (BDNF), neurotrophin-3 (NT-3) and neurotrophin-4/5 (NT-4/5). These polypeptides are called neurotrophins.

Now your introduced term is at the stress point of the paragraph. I would need to query the author about the meaning and importance ‘discrete, and sometimes overlapping’ phrase, but I think it is a separate thought and should be presented in its own sentence.

Give your reader context and perspective on new information before you introduce it. Place information where your reader expects to find it, and put information you want your reader to remember in the stress position of sentences and paragraphs. When you do these things, more people will read and remember what you write.

Summary

To ensure maximum clarity in your writing remember to edit for nominalised words, be precise with your language, use parallel constructs, and place

information where the reader expects to find it. Although incorporating these four writing principles requires time, thought and often much editing, applying them to your writing can help you communicate complex subjects clearly and accurately.

Further reading

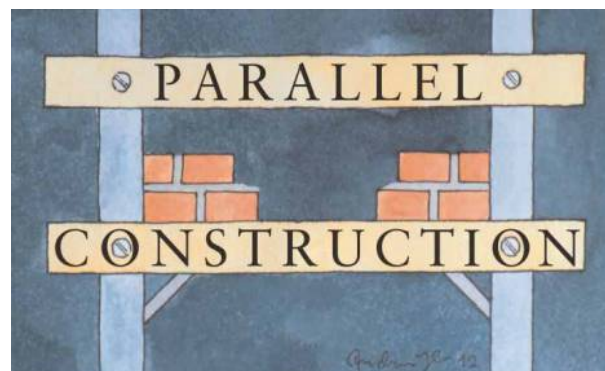
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Michele Arduengo received her B.A. in Biology from Wesleyan College in Macon, GA, USA, and her Ph.D. through the Biochemistry, Cell and Developmental Biology Program at Emory University in Atlanta, GA, USA. She has worked as an editor and writer in the life sciences for over 15 years and is certified by the Board of Editors in the Life Sciences (BELS). Currently, she is a writer/editor at Promega Corporation in Madison, WI, USA, where she works on technical literature, the corporate blog, and technical content for mobile applications.