

The Science of Medical Writing

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My Perspective: What Writing Is

- **Communication** vs self-expression
- **Storytelling** vs listing everything we know
- Making the **important interesting**



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USAGE



Usage Principles

- Purpose
- Realism
- Linguistic simplicity
- Concision or tightness
- Readers' reactions
- Differentiation
- Needless variants

Garner's Modern American Usage, 2003.



Linguistic Simplicity = Plain Language

- Science = innovative
- Communication of the science = straight-forward
- Consider your audience
 - Students and those new to the field
 - Nonspecialists
 - Global audience



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WORD CHOICE



To be or not to be, that is the question.

Not to be, that is the answer.



Differentiation

- Use other verbs than “to be”
 - Patients who are concerned about... > Patients who have concerns about..
- Never start a sentence with “There was..”
 - There was an increase in x... > An increase in x occurred... > X increased...
- Create verbs out of the nouns already used in the sentence



How to Find Verbs

Ending	Noun	Verb
-tion/-sion	stimulation formation activation expansion utilization	stimulate form activate expand use
-ment	treatment management measurement assessment	treat manage measure assess

Zeiger. *Essentials of Writing Biomedical Research Papers*, 2000.



How to Find Verbs 2

Ending	Noun	Verb
-ence/-ance	occurrence precedence resistance compliance	occur precede resist comply
-al	removal arrival beneficial (adj)	remove arrive benefit

Zeiger. *Essentials of Writing Biomedical Research Papers*, 2000.



Needless Variants

- Do not alternate key terms
 - physician, primary care provider, PCP, clinician
- Pick a term and stick with it
 - readmissions vs same-cause readmissions
- Pronoun abuse
 - unclear referent, when it's just as easy to spell out the term again
- Similar terms must carry distinct meanings
 - HER2, *her2*, *HER-2/neu*, *her2*, HER2⁺, ERBB2, Erbb2



Differentiation and Needless Variants

- Vary your verbs
- Use consistent nouns



Concision or Tightness

- Learn to love page limits and word count
- Eliminate extra words
- Justify the use of every word
- Short sentences are not wrong
- Short words are also not wrong



For the Love of Of

Commonly Used	Shortened Term
the majority of	most
a number of	many
third quarter of 2012	third quarter 2012
spring of 2008	spring 2008
January of 2014 or January, 2014	January 2014
in the year 2000	in 2000
the use of	using
the treatment of	treating
the management of	managing

Articles of Faith: a, an, the

- Articles are generic and often add little to the text
- Consider each instance
- Can be more specific (eg, this, that, our)
 - The study of antitumor immunity will explore first-in-human use of..
 - This study of antitumor immunity will explore first-in-human use of..
 - Our study of antitumor immunity will explore first-in-human use of..
- Can be intentionally general (delete a or an and make plural)
 - A patient could benefit from...
 - Patients could benefit from...



Redundancies

Commonly Used	Unredundant Term
past history	history
past experience	experience
time period, period of time	period
published literature	literature
previously published	published
at a later time	later
a time when	when



Redundancies 2

Commonly Used	Unredundant Term
future plans	plans
working together with	working with
4 separate occasions	4 occasions or 4 times
3 different studies	3 studies



Redundancies 3

Commonly Used	Unredundant Term
strenuous physical activity	strenuous activity
visual appearance	appearance
whether or not	whether
were to be	were



Contentious Terms

Commonly Used	Correct in Medical Writing
female/male	women/men
gender	sex
statistically significant	significant
elderly	older patient, older person, person aged ≥ 65 years
sacrificed	killed
cancer patients, diabetics, epileptics	patients with cancer, patients with diabetes, patients with epilepsy

AMA Manual of Style, 10th ed.



Needless Lead-Up

Commonly Used	Short Version
Of note...	
Of importance to note..	(just start the sentence)
The fact that...	
Firstly,...	First, (and only for a true sequence)
To facilitate demonstrations of...	To show...



Hyperbole or Overstatement

Commonly Used	Short Version
I was able to participate	I participated
a tremendous amount of experience	tremendous experience
a demonstrated record of	a record of
in the domain of	about
suffered from	had
would likely	might



Wrong Usage

Commonly Used	Correct Use
a myriad of (noun)	myriad (adjective)
comprised of	X comprises Y
	Y is composed of X
mitigate against	mitigate



When Space Is Limited*: Short Words

Commonly Used	Short Version
demonstrate	show
multiple	many
in order to	to
additionally	also
Consequently,	So,
In the event of	If

*and even when it's not



When Space Is Limited*: More Short Words

Commonly Used	Short Version
based upon	based on
dependent upon	depending on
as well as	and
utilize	use
one, two, three, etc	1, 2, 3, etc
i.e., e.g., etc.	ie, eg, etc

*and even when it's not



Other Usage Tips

- Eliminate *-ly* adverbs
 - Only *is* is the only exception

- Use *less* and *fewer* correctly
 - Less: volume or mass
 - Fewer: number (persons or things)

Fewer interventions may not always mean less care.

10 items or fewer

- If you use *and* to connect short sentences, delete *and* and use short sentences

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SENTENCE STRUCTURE



Types of Sentences

- Simple
- Compound
- Complex
- Compound-complex



Simple Sentences

- Simple
 - 1 independent clause
 - *The dog barked.*
- Compound
- Complex
- Compound-complex



Compound Sentences

- Simple
- Compound
 - 2 or more independent clauses
 - *The dog barked, and the phone rang.*
- Complex
- Compound-complex



Complex Sentences

- Simple
- Compound
- Complex
 - 1 independent clause
 - 1 or more dependent clauses
 - *As she unlocked the front door, the dog barked.*
- Compound-complex



Compound-Complex Sentences

- Simple
- Compound
- Complex
- Compound-complex
 - 2 or more independent clauses
 - 1 or more dependent clauses
 - *As she unlocked the front door, the dog barked and the phone rang.*



Fragments

- A group of words that pose as a sentence
- Lack both a subject and a verb
 - *Everyone sitting in this seminar.*
 - Everyone was sitting in this seminar.



Comma Splices

- Independent clauses joined only by a comma
- Lacking a conjunction (eg, and, but, or, thus, yet, however)
 - *Gestures carry meaning for everyone, they are crucial for the hearing-impaired.*
 - Gestures carry meaning for everyone, however, they are crucial for the hearing-impaired.



Fused Sentences (Run-ons)

- Adjacent independent clauses
- Lacking a conjunction (eg, and, but, or, thus, yet, however)
- Lacking punctuation
 - *Gestures carry meaning for everyone they are crucial for the hearing-impaired.*
 - Gestures carry meaning for everyone, but they are crucial for the hearing-impaired.



Reader-centered Writing

- Readers expect writing to follow certain rules
 - They expect to find information where they are trained to look for it
- At the beginning of a sentence
 - Linkage information (which looks backward)
 - Context (which looks forward)
 - The topic position
- At the end of a sentence
 - New information
 - The stress position

Gopen and Swan. *American Scientist*. 1990;78:550-558.

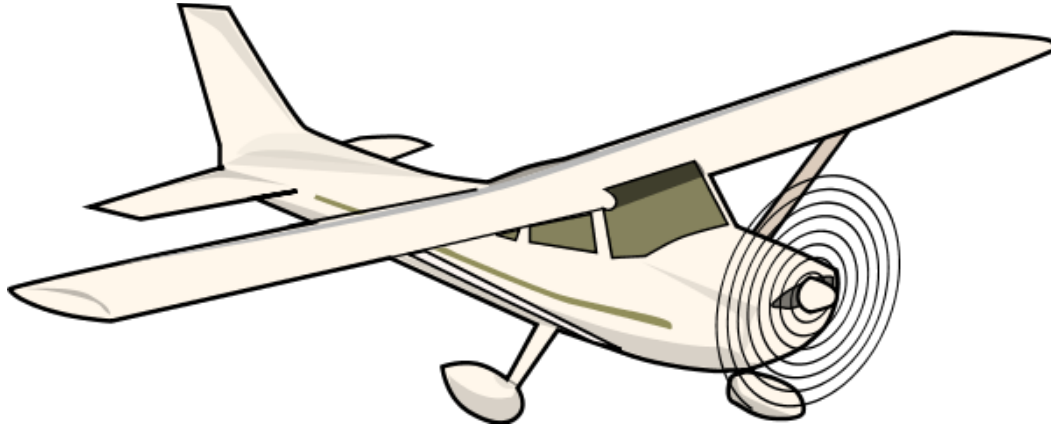


Emphasis

- English uses a 2-part structure
 - subject, predicate
 - inherent rhythm in this structure
- We expect the emphasis at the end
 - Beginning ⇨ some stress
 - Middle ⇨ little stress
 - End ⇨ most stress



Sentences Need to Land



Cliches to Land a Sentence

- Save the Best Till Last
 - Put the important, new, exciting information in the stress position
- First Things First
 - Orient the reader by putting the old, bridging information in the topic position

Gopen and Swan. *American Scientist*.1990;78:550-558.



Common Problems with Landing

- Tangents
- Over-explanation
- Redundancies
- Contextualizing phrases after the fact
- Sentences with more than 1 idea



Embrace the Stress (position)

- Watch for tangents or over-explanation
- Delete redundancies
- Move contextualizing phrases to the beginning
- Write shorter sentences



Voice: Active or Passive

Readers expect the story to be about whoever shows up first

We found a significant difference between X and Y.

A significant difference was found between X and Y.

The results showed a significant difference between X and Y.

X and Y were significantly different.



Sentence Patterns

- Aggregation
 - Keep things that belong together, together
- Separation
 - Separate things that don't belong together
- Predication
 - Each part of a sentence has its own force (emphasis, stress)
 - Match the importance of the thought with the appropriate part of the sentence



Noun-Verb Distance

- Having too many words between the subject and its action
- Goal
 - To have subject and its action adjacent



Noun-Verb Distance 2

Higher baseline serum 25(OH)D concentrations among older adult male smokers (>65.5 vs <32 nmol/L; OR=2.9) living in Finland were reported to increase the risk of exocrine pancreatic cancer compared with those with lower concentrations.

Distance = 14 words

Among older adult male smokers in Finland, higher baseline serum 25(OH)D concentrations were reported to increase the risk of exocrine pancreatic cancer compared with those with lower concentrations (>65.5 vs <32 nmol/L; OR = 2.9).

Distance = 0 words



Parallel Structure

- Coordinate ideas (alike or contrasting) should be expressed in similar structures
- Eases understanding
- Allows succinctness
- Good form
- Easy to correct
 - Add conjunctions
 - Add adjectives (including articles)
 - Rearrange sentence elements



Conjunctions

Coordinate	Correlative
and	both...and
or	either ... or
nor	neither ... nor
but	not only ... but also



Techniques for Well-Written Sentences

- Keep sentences short (enough)
- Ensure that sentences land
- Express core message clearly
- Avoid noun strings
- Put parallel ideas in parallel form

Gopen and Swan. *American Scientist*. 1990;78:550-558. Zeiger. *Essentials of Writing Biomedical Research Papers*, 2000.



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PARAGRAPHING AND OUTLINING



Paragraphs Aid in Storytelling

- Ideas must be organized
- Relationships between ideas must be clear (continuity)
- Important ideas must be emphasized

Zeiger. *Essentials of Writing Biomedical Research Papers*, 2000.



Outlines Aid in Paragraphing

- Organize thesis and topic sentences
- Structure supporting sentences within paragraphs (relationships > continuity)
- Establish document flow



Paragraph Organization

- Overview first
 - Title and Thesis
 - Topic sentences for each paragraph
- Details
 - Populate facts
 - Organize ideas/sentences



Elements of Formal Outlines

- Title
- Thesis statement
- Topics / Topic Sentences (define each paragraph)
 - Facts
 - Sentences
 - Details
 - Other elements based on specific requirements
 - Tables
 - Figures
 - References



Topic Outline vs Sentence Outline

- Topic Outlines
 - Present information in short phrases or words
 - Do not use complete sentences
 - Quick to create
- Sentence Outlines
 - Built of complete sentences
 - Longer to create
 - Save writing time



Topic Outline Example

Title: Management of Hypertension

Thesis: Hypertension can be managed using a combination of approaches

I. Goals of therapy

- A. Reduction of cardiovascular morbidity and mortality
- B. Reduction of renal morbidity and mortality

II. Interventions

- A. Lifestyle modifications
 1. Weight loss
 2. Adoption of DASH eating plan
 3. Reduction of sodium consumption
 4. Physical activity
 5. Moderate alcohol consumption



Sentence Outline Example

Title: Management of Hypertension

Thesis: Hypertension can be managed using a combination of approaches.

1.0 Clinicians have two goals when managing hypertension.

1.1 Cardiovascular morbidity and mortality can be reduced.

1.2 Renal morbidity and mortality can be reduced.

2.0 Multiple interventions can be used to manage hypertension.

2.1 Lifestyle modifications should be attempted before other approaches.

2.1.1 Patients should achieve or maintain their ideal weight.

2.1.1 Patients should adopt the DASH eating plan.

2.1.2 Patients should reduce sodium consumption.

2.1.3 Patients should be physically active.

2.1.4 Patients should consume alcohol in moderation.



Thesis Statement

- Establishes the burden of the paper
- Holds the key to the outline
- Restricts and unifies the ideas of the paper
- In an article, may appear in the conclusion or at the end of the introduction



Topic Sentences

- Define what the paragraph is about
- Clarify the main point of the paragraph
- Use a key term
- Have only 1 message per paragraph
 - This is why an outline is useful
 - You can prioritize and order your topics
- Clearest and most powerful if short and simple



Paragraphing Patterns

Least to most important

Funnel

Most to least important

Spiral

Announced order

Chronological order

Pro-Con

Problem-solution

Pro

Solution-problem

Con

Zeiger. Essentials of Biomedical Research Papers. 2000.



Sentence Landing Aids in Paragraphing

- Always bridge between paragraphs
 - Linking information and context in topic position of the first sentence
 - Often an introductory clause
 - Because of the relationship between X & Y,...
 - In this context,..
 - Based on the research...
- End paragraphs with information that makes the reader want to keep reading
 - Capitalize on the stress position to maintain momentum



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EDITORIAL ISSUES



Punctuation

- Limit punctuation use to commas and periods
- Most people use punctuation to appear smart
 - You don't appear smart if you use punctuation wrong or too creatively (ie, wrong)
- Parentheses not like math ([{ }])

AMA Manual of Style, 10th ed.



More On Punctuation

- Hyphens are either underused or overused (ie, misused)
 - 19 month old infants
- Avoid apologetic quotes (or apostrophes)
 - the “field”
 - the “syndrome”

AMA Manual of Style, 10th ed.



Abbreviations

- Spell out at first use
 - If abbreviated in abstract, spell out again in manuscript body
 - Exceptions: DNA, RNA
- Avoid in manuscript abstracts
- Don't invent
 - Consider the reader
 - WG ≠ whole grain
 - RG ≠ refined grain

AMA Manual of Style, 10th ed.



Tables and Figures

- Do not repeat information in the text
- To make a point, interpret a bit

Instead of	Write
50% of the cohort was male.	Men and women were equally represented (Table 1).
82% were Caucasian.	Most of the participants were white (Table 1).



Resources

- *AMA Manual of Style: A Guide for Authors and Editors*. 10th ed. New York: Oxford University Press, Inc; 2007.
- Mimi Zeiger. *Essentials of Writing Biomedical Research Papers*. 2nd ed. New York: McGraw-Hill Health Sciences Division; 2000.
- George G Gopen and Judith A Swan. The Science of Scientific Writing. *American Scientist*. 1990;78:550-558.
- Bryan A Garner. *Garner's Modern American Usage*. 2nd ed. New York: Oxford University Press, Inc; 2003.



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THANK YOU

