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Strategies for Writing a Scientific Article

The following are several approaches to writing a scientific article. Different approaches work for different authors.

- Outline each section of the article. Expand the outline components into sentences, and add sentences and headings to complete each section.
- Write down phrases describing things you want to include in the article as they occur to you; and classify each phrase as belonging in Introduction, Methods, Results, or Discussion. Expand the phrases into sentences, and add sentences and headings to complete each section.
- Make your tables, graphs, and other figures; and write text describing each (for the Results section), text describing how you performed the experiments (for the Methods section), text describing why you did the study (for the Introduction section), text describing your conclusions (for the Discussion section), and a summary (for the Abstract).
- Write the easiest sections (Methods and Results) first and then the harder ones (Introduction and Discussion).
- If you are uncomfortable writing, try tape recording yourself describing your study, and then transcribe the tape and edit it into the article.
- Write the Abstract first, as a guide to writing the entire article; or write the Abstract last, by assembling the most important sentences in each section of the article.

Searching the Literature

To conduct a thorough search of the medical/scientific literature, follow these steps:

1. Decide on the subject of your literature search: the topics of your research and how they relate to each other. What search terms will adequately represent these topics?

- Write down all search terms related to your topic, including synonyms, abbreviations, and other possible variants of the terms.
- Learn how to combine terms correctly using operators (*and, or, not,* etc.) in online and CD-ROM database searches.

2. Decide on the extent of your search: how wide and how far back your search should go.

- What kinds of literature do you want to search? Searches for sources other than journal articles, including books, technical reports, and grant summaries, might require a different strategy.
- Will you include papers in languages other than English in your search?
- How many years back do you plan to search?

3. Decide on the bibliographic databases through which you will search for relevant papers.

- In most cases, 1 or a combination of the following resources is enough: MEDLINE or *Index Medicus*, *Science Citation Index*, and *BIOSIS Previews*.
- When possible, use the MeSH terms in *Index Medicus* to conduct MEDLINE or *Index Medicus* searches.

4. Decide on how you will record the references and notes from your search.

- Keep a record of your search terms, including synonyms, variants, abbreviations, and MeSH terms.
- Record the databases searched, the years searched, and any limitations (such as English-language only) placed on your searches.
- Keep a list of the articles found that you do not intend to use (so that you do not go back to them on later searches).
- Use available software programs (such as EndNote or Reference Manager) to track the references to articles you plan to use (see Chapter 9, References, for more information).

Adapted from Huth EJ. *How to Write and Publish Papers in the Medical Sciences.* 2nd ed. Baltimore, MD: Williams & Wilkins Co.; 1990.

Proofreading Your Typeset Article

Once a manuscript is accepted, it is sent to the publisher to be produced into a published article. This is called the production process or stage. During this stage, the manuscript is copyedited, the figures are prepared for publication, and the text is formatted according to the style of the journal. The production process may take several weeks or several months.

Almost all journals will send you a typeset proof of your article before it is published. The purpose of your seeing the proof is so that you can catch any errors that have been introduced during the copyediting and preparation of your article. Try as much as possible to mark your corrections using standard proofreaders' marks (these marks and how to use them are shown in *Words Into Print*). Using standard proofreaders' marks will ensure that your corrections are understood. Following are "do's" and 1 "don't" for proofreading.

Do

- Make sure all your figures are present, nothing essential was cut off or no important details were lost when the figures were reduced to fit the journal, and the figures are oriented correctly (the top is up). Make sure that all parts of multipart figures are there.
- Make sure the right legends are with the right figures.
- Make sure all your tables are present and all the material in the tables aligns correctly.
- Double-check any drug dosages.
- Make sure no errors have been introduced during copyediting.
- Make sure any special characters (such as Greek letters or mathematical symbols) have not been lost or changed during software conversion.
- Respond to the copyeditor's questions.
- Read the proof through from the title through the last reference:
    - Does it say what the accepted manuscript said?
    - Are all the numbers and values correct?
    - Is any material missing?
    - Are there misspellings or other typographical errors?

Don't

- Rewrite your manuscript or change your manuscript substantially in any way.

If you believe that a substantial change to a proof is necessary for some reason, get the editor's consent before making it. Depending on the change, the editor may believe the article should be withdrawn and then resubmitted.

If you find a serious problem on the proof, contact the managing editor or production editor immediately.

And *always* return your proof on time. You will usually be given only 48 hours within which to review your proof. If your changes are not received by the publisher on time, your article may be held over to a later issue.

Useful Reference Books for Writing and Editing English

Azar BS. ***Chartbook: A Reference Grammar: Understanding and Using English Grammar***. 3rd ed. White Plains, NY: Pearson Education; 2000.

A good ESL reference book for those who are at an advanced level, it offers many easy-to-understand grammar explanations, and it isn't too big to carry with you.

Campbell E. ***ESL Resource Book for Engineers and Scientists***. New York: John Wiley & Sons; 1995.

This book combines the fundamentals of technical writing with ESL grammar guidelines.

Horner WB, ed. ***Harbrace College Handbook: With 1998 MLA Style Manual Updates, Revised Brief 13th Edition***. Orlando, FL: Harcourt Brace College Publishers; 1998.

A good basic handbook about English grammar.

Huth EJ. ***How to Write and Publish Papers in the Medical Sciences***. 3rd ed. Baltimore: Lippincott, Williams & Wilkins; 1998.

Written by a distinguished physician, author, and editor, this book will give you the details we did not have time for in this program. Highly recommended!

Iverson C et al., eds. ***American Medical Association Manual of Style: A Guide for Authors and Editors (AMA)***. 9th ed. Baltimore: Williams & Wilkins; 1998.

This is the definitive manual of guidelines for medical writing. Developed by a committee of writers, editors, and publishers, it is organized into the following sections: how to prepare an article for publication, style, terminology, measurement and quantitation, and technical information.

National Library of Medicine. ***List of Journals Indexed in Index Medicus***. Bethesda, MD: National Institutes of Health; 2004.

This resource book provides a comprehensive list of medical journals and their standard abbreviations. You can search by full title, abbreviation, subject, or geographic location. This is very helpful in creating reference lists and bibliographies.

Merriam-Webster's Collegiate Dictionary. 11th ed. Springfield, MA: Merriam-Webster, Inc.; 2003.

Every writer needs a good dictionary, and this one comes from 100 years of experience. It has more than 215,000 definitions, including usage date, word history, pronunciation, synonym cross-references, examples of usage, and variant spellings. Three valuable sections included at the end of the dictionary are on abbreviations, biographical names, and geographical names.

Merriam-Webster's Collegiate Thesaurus. Springfield, MA: Merriam-Webster, Inc.; 1994.

You won't find definitions in a thesaurus, but for each word, you can find related words: common synonyms, related terms, and antonyms (opposite meanings). This is a great reference tool for writers who want to add to their vocabulary or who can't quite remember a particular word. But be sure to look up unfamiliar words in a dictionary before using them in your paper—often there are fine distinctions in meaning between words that a thesaurus does not reveal.

Sample (numbers denote groups of synonyms):
determine *vb* **1 syn** ESTABLISH 6, demonstrate, make out, prove, show
rel fix, set; settle
2 syn PREDESTINE 1, destine, doom (to), fate, foreordain, predetermine, perform, preordain
3 syn DEMARCATE 1, bound, delimit, delimitate, limit, mark (out), measure
4 syn DECIDE, conclude, figure, resolve, rule, settle
rel bias, dispose, incline, predispose; actuate, drive, impel, move; induce, persuade
5 syn CLOSE 3, complete, conclude, end, finish, halt, terminate, ultimate, wind up, wrap up
6 syn DISCOVER 3, ascertain, catch on, find out, hear, learn, see, tumble, unearth

Ross-Larson B. ***Edit Yourself: A Manual for Everyone Who Works with Words***. New York: W.W. Norton & Company; 1996.

An alphabetically organized list of common errors, a guide on how to avoid using the passive voice, and examples of "lean, mean" writing make this book helpful to writers who want to improve.

Sample:

data is	CHANGE TO	data are
(examine in) depth	CHANGE TO	examine
demonstrate	TRY	show
distinctive [individual]	COMPARE	distinct [clear]

Strunk W Jr. & White EB. ***The Elements of Style***. 4th ed. Boston: Allyn & Bacon; 1999.

There has never been a better book about how to write clearly and concisely, and the rules of English grammar are addressed in just 85 pages. Writers should make a point of reading this classic book each year.

Helpful Online Resources

Dictionaries, Terminology, Abbreviations, and Acronyms

AF Acronym Finder
http://www.acronymfinder.com/
Searchable, growing database of more than 5 million English acronyms and initialisms

The Phrase Finder
http://www.phrases.org.uk/
Meanings and origins of phrases, sayings, clichés, and quotes

Dictionary.com
http://dictionary.reference.com/
Powerful online dictionary that draws on multiple general and technical dictionaries, plus online thesaurus, language translators, and more

Biochemical Nomenclature and Related Documents
http://www.chem.qmul.ac.uk/iupac/bibliog/white.html
Full online access to the "White Book," which describes a range of technical, mathematical, and biomedical terms. Provided by the International Union of Pure and Applied Chemistry and International Union of Biochemistry and Molecular Biology

MedBioWorld
http://www.medbioworld.com/
Contains links to medical journals, associations, and databases, including general dictionaries, reference tools, medical glossaries, bioscience glossaries, and computer science glossaries

National Human Genome Research Institute's Talking Glossary of Genetic Terms
http://www.genome.gov/glossary.cfm
Audio guide to the pronunciation, definition, and description of genetic terms and concepts, in English and Spanish

Literature Searches

Research Medical Library
https://www3.mdanderson.org/library/services/literature_searching.html
MD Anderson staff can request a literature search by a medical librarian.

Library Databases
https://www3.mdanderson.org/library/databases/index.html
Search PubMed, Scopus, Web of Science or other databases for the latest literature.

U.S. National Library of Medicine's Medical Subject Headings (MeSH)
http://www.nlm.nih.gov/mesh/
Explanation of the MeSH system and how it is maintained and updated, plus a link to the MeSH Browser, an easy way to find and verify MeSH terms

EndNote Help
https://www3.mdanderson.org/library/education/endnote.html
MD Anderson staff can request help with EndNote for creating bibliographies.

Writing and Editing

Instructions to Authors in the Health Sciences
http://mulford.utoledo.edu/instr/
A comprehensive, frequently updated list of links to author instructions for more than 6,000 journals in the health and life sciences

International Committee of Medical Journal Editors' Uniform Requirements for Manuscripts Submitted to Biomedical Journals
http://www.icmje.org/
Author instructions and ethical guidelines used by more than 500 biomedical journals. The source for "Vancouver style"

National Institutes of Health Center for Scientific Review
https://public.csr.nih.gov/pages/default.aspx
Helpful information for writers of grant proposals

CONSORT Guidelines
http://www.consort-statement.org/consort-2010
Guidelines for reporting randomized controlled trials (many journals require compliance)

Equator Network
http://www.equator-network.org
A collection of guidelines for reporting many types of studies and analyses

American Chemical Society's Author and Reviewer Resource Center
http://pubs.acs.org/page/4authors/index.html
Advice on writing, ethics, and the submission process

English as a Second Language

Scientific English as a Foreign Language
http://users.wpi.edu/~nab/sci_eng/
Short lessons on word usage and grammar in scientific English writing

Using English
http://www.usingenglish.com/
A large collection of tools and resources for speakers of English as a second language

Purdue Online Writing Lab
http://owl.english.purdue.edu/owl/resource/678/01/
Resources and exercises for speakers of English as a second language

Academic Phrasebank
www.phrasebank.manchester.ac.uk/
Examples of phrases commonly used in academic writing

Miscellaneous

Research Medical Library
www.mdanderson.org/library/
Free access from your MD Anderson computer to an extensive set of databases, online books, and online journals; plus information on the library's services, classes, catalogue, and more.

Hoaxbusters
http://hoaxbusters.org/
Describes hoaxes and chain letters found on the Internet

U.S. Copyright Office
www.copyright.gov/
Links to frequently asked questions about copyright and summaries of basic copyright law

National Institutes of Health Public Access
http://publicaccess.nih.gov/
How to comply with the NIH's Public Access Policy

Copyright Clearance Center
http://www.copyright.com/
Centralized resource for obtaining permission to reuse material for business or academic purposes; UT system has an annual license agreement

Specialized Terms & Abbreviations Log

Use this log to record the key words and abbreviations you use in your research to ensure that you spell and format them consistently. A couple of examples are provided.

kDa for kilodalton	
benzo[*a*]pyrene	