Resource Guide for Scientific Writing and Presentations

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A. INTRODUCTION

At the core of success in academic biomedicine is research and publication of the results in a peer-reviewed biomedical journal. For clinical and basic science researchers forging an academic career, publication documents not only their intellectual property but also their productivity. Publication justifies funding for research, makes reputations, and builds careers. Too often, the actual writing of scientific papers and grant applications is a skill more or less learned by “osmosis” in academic biomedicine. This resource guide is intended to help you succeed in writing, publishing, and presenting your research, preparing fundable grant proposals, and if you are a resident, preparing CVs and personal statements for fellowships.

B. WRITING PAPERS

1) Get Organized. Before you can write you need to figure out which findings to present in this paper. Start with a plan or outline of your key results and the data, figures, and tables that support those results. The best papers are often hinged on a single main finding, and that finding is directly linked to the question or hypothesis that led you to do the study.

Once you have your tables and figures, you can draft the Results section to follow them (e.g., for clinical/epidemiological studies: subjects, univariate main outcome, multivariate associations with main outcome, sub-analysis of important groups and potential biases; for basic science studies: experiments in chronological order or most important first, followed by supporting and mechanistic data). After following steps 2-4, you can go ahead and write the other parts of the paper.

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2) Decide on the Journal. You and your collaborators will make that decision based on several considerations, including the scientific merit of the findings, the intended audience, and the prestige of the journal. The key is to find the right audience for the message of the paper. To do this, you need to answer two questions: What do you have to say and who needs to hear about it? (aka the “So What and Who Cares” test). The choice of a journal will dictate the length of your paper and its overall organization.

3) Read the Journal’s Instructions for Authors. Journals differ in their requirements for style, format, and organization of manuscripts. Most journals place limits on the number of words or characters in a manuscript or in sections of the manuscript. To save yourself the agony of having to cut a manuscript by hundreds (or thousands) of words, read the journal’s Instructions to Authors before you begin to write and follow those instructions to the letter. Consult a recent issue to be certain your paper is written in the journal’s preferred style. Reading sample articles can also clarify aspects of manuscript preparation and formatting not specifically mentioned in the instructions. Editorial processing goes faster if you have followed the journal’s instructions carefully. Not following the instructions can delay publication and make more work for you at a time when you should be working on your next article!

4) Know Your Audience. Writing to be published is not the same thing as writing to be read. Journal editors choose articles with their readers in mind. Communicating scientific findings in a journal means you have an audience of readers—you aren’t just writing for the scientists who will serve as peer reviewers for your work. To communicate effectively with a varied audience (from graduate students to Nobel laureates), plan to go through several drafts to make sure that the message of the paper is not obscured by poor organization, gaps in logic, excessive detail, and wordiness (See part C below on Revising Your Prose).

5) Determine the Structure of the Paper. Most biomedical research papers consist of four main sections, each of which have a specific purpose and should contain only certain types of information:

- Introduction – Awaken interest, orient the reader, establish study question or hypothesis.
- Methods – Describe what you did—in enough detail—so readers can judge whether the findings you report in your Results section are reliable support for your conclusions.
- Results – Present the findings of the experiments or procedures described in the Materials and Methods section and refer the reader to the data in tables and figures that support the results.
- Discussion – Answer the question(s) posed in the introduction and briefly convey how the results support your answer. Explain how your findings and conclusions relate to existing knowledge on the subject.

In most biomedical journals, the order of the sections is “introduction/materials & methods/results/discussion” or “IMRaD”, but for some basic science journals, the order is “introduction/results/discussion/methods”, or “IRDaM”. That’s why is so important to identify the target journal before you write.
6) Resources for Writing Papers

Reports of Original Research
The links on the next page take you to two excellent series of short and pithy articles that will help you write each part of the research paper: Introduction, Methods, Results, Discussion, Title, Abstract, Figures, Tables, and related items. **If you are writing a paper that follows the IRDaM structure**, the only resource is an article in the collection of articles in the journal *Clinical Chemistry*. **NOTE:** All articles in *Clinical Chemistry* series are available in Spanish and Chinese translations.

- *Clinical Chemistry* Guide to Scientific Writing:
  http://www.aacc.org/publications/clin_chem/ccgsw/Pages/default.aspx

- *Chest Journal* Medical Writing Tips:

Statistics
Take advantage of this very understandable (for statistics!) series of articles geared towards clinicians:

This user-friendly website for statistical computation comes highly recommended:
http://www.vassarstats.net/

Review Articles
The traditional "narrative" or "scholarly" review: http://www.clinchem.org/content/57/3/388.full and
http://www.ease.org.uk/sites/default/files/writing-reviews.pdf

http://www.epibiostat.ucsf.edu/courses/schedule/systematic_reviews.html

Case Reports and Case Series
Contact me if you'd like a slide presentation that covers how to write these specific types of papers.
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C. REVISING YOUR PROSE

Once you’ve written the paper, your focus must turn to revising it so that your message is clear. Most any advice you read about writing scientific papers tells you to write *clearly*. It’s easy to SAY this and quite another to DO it. Good writing is *rewriting*. Nobody writes a polished paper in one draft, or even two.

The Big Picture. In revising your manuscript, take care of the “big things” before you start worrying about the smaller details.

1) Make sure the various parts of the manuscript are in synch with each other. Is everything in the proper place? Is each part of the manuscript accomplishing what it’s supposed to?
2) Read through the manuscript, putting yourself in the position of a reader who knows nothing about your work. Is everything clearly and logically arranged? Are there any gaps in the logic or the story you’re telling? Are there places where the reader might get bogged down in excessive detail? Are there internal inconsistencies? For example, does the conclusion of the abstract match the conclusion of the discussion?

3) Does each paragraph have a topic sentence? Is everything in the paragraph related to the topic and will the relationships be clear to the reader? Paragraphs should be clear, focused, and relatively short. If you find a paragraph that goes on for a page, or two pages, or more, break it into a series of shorter paragraphs. Make sure there are good transitions between paragraphs. As the author, it is your job to make sure that the reader never has to struggle to understand what you’re trying to say.

4) Check each figure and legend against the text. Are they working synergistically, or is there excessive overlap? Are all the figures cited in the text? Do the citations in the text match the legends? Do the figures/panels cited actually support the statements made in the text?

The Details. Once you’re satisfied that the “big picture” items are in place, you can focus on the details of revising individual sentences. The key rule to remember in trying to achieve clarity is that your science is complex, so the goal is to keep everything else as simple as possible (despite what Calvin says in the adjacent cartoon).

1. Use abbreviations (sparingly) for:
   Long terms (e.g., HPLC)
   Terms used many times
   Terms known by their abbreviations
   Define at first mention in abstract and in text.
   Define only once. Delete if used infrequently.
   Check for “standard” abbreviations

2. Use precise words
   increase/decrease NOT change; rat, mouse NOT animal

3. Use simple words
   before NOT prior to; after NOT following; begin NOT initiate; is NOT constitutes, represents, etc.

4. Use fewer words
   It is thought that……………….They (we) think
   It would thus appear that……….Apparently,
   In light of the fact that…………….Because
   It is often the case that…………..Often
   It is possible that the cause is…The cause may be
5. Avoid running starts
It is interesting to note that...; It is not impossible that...; A not unlikely cause could be that...; It may be said that...etc. Delete these “IT...that” phrases.

6. Write simple, direct sentences
Complicated sentences are hard to follow, slow the reader down, and are often confusing. For a sentence to be simple and direct:

Make the topic the subject of the sentence.

**Example:** The mice showed no increase in lipid levels.

**Revision:** Lipid levels in the mice did not increase.

Put the action in the verb of the sentence.

**Example:** An increase in heart rate was seen.

**Revision:** Heart rate increased.

To make the topic the subject and put the action in the verb, look for:

Nouns made from verbs: formation, measurement, occurrence, removal
“Increase” and “decrease” as nouns
Weak verbs: was achieved, was observed, occurred

7. Write comparisons clearly
*NOT* "These results were similar to previous studies" (that’s comparing an apple to an orange), *but* "These results were similar to the results of previous studies".

Use "greater than" or "less than" instead of "compared to", especially when talking about an increase or decrease.

8. Use passive voice selectively
Use the **active voice** to focus on the person who is performing the action, as when stating a goal, intention, or hypothesis: "We tested the hypothesis".

Use the **passive voice** to emphasize the object that is being acted upon, as in describing a method. "Cells were washed".

9. Get the verb tense right
Use the **present tense** to describe what is known or generally accepted.
Use the **past tense** to describe what you did (Methods) and what you found (Results).

10. Avoid common writing problems
Use clear pronouns- be careful with the words "this" in particular, because often it doesn't refer back to anything (or if it does, it refers to the wrong noun!). If necessary, repeat the noun that "this" refers to.
Check that subject and verb make sense together. "Controls were performed" doesn't make sense. "Control experiments were performed" does make sense.

Remember to use the correct "helping "verb" (were, was) when the subject shifts from plural to singular or vice versa (especially in the Methods section).

Watch out for dangling modifiers, especially in the Methods section:

Example. Blood flow was allowed to return to baseline before proceeding with the next experiment. (Blood flow is what proceeds with the next experiment!)

Revision. Blood flow was allowed to return to baseline before the next occlusion was begun.

11. Write logically organized paragraphs
Paragraphs make your writing more accessible and easier to read because they break your writing up into manageable units that readers can process. They help you tell a clear story by treating an idea in each paragraph and connecting the paragraphs to each other. Well-written paragraphs usually make a point and develop it. You can follow the author's thinking because he or she has focused on a single idea and doesn't go off in several different directions.

To write well organized paragraphs:
• Use a topic sentence to state the main idea of the paragraph clearly and directly.
• Give the details that support the topic sentence in subsequent sentences.
• Supporting sentences should be organized in a logical way:
  Most to least important
  Pro-con
  Pro
  Con
  Chronological order
  Problem-solution
  Solution-problem

12. Use continuity techniques
Even if a paragraph is well organized—that is, it has a topic sentence and logically organized supporting sentences, the story of the paragraph can be hard to follow if the paragraph lacks continuity. Continuity is the smooth flow of ideas from sentence to sentence (and from paragraph to paragraph). The essence of continuity is a clear relationship between every sentence and the sentence before it. Using topic sentences is one way to establish continuity, but there are other important ones to know about:

Key terms are terms that name important ideas in a paper. They can be technical like G-protein, mitogenesis, or decisional conflict. They can also be non-technical terms like increase, function, or rural. Repeating key terms exactly from sentence to sentence and paragraph to paragraph is the strongest technique for providing continuity. If a key term is not repeated exactly and instead, another term is used, the reader needs to do a mental manipulation to see the relationship between the two terms. In other words, it forces the reader to divert some of his or her attention from the science to the writing. It comes between the reader and the message. The clarity of the prose is affected, as T. E. Lawrence put it, "Prose is bad when people stop to look at it."

Transitions terms like therefore * thus * for example first * second * third* last * in addition * in contrast * however * because * furthermore/moreover *in brief * although * whereas, etc., let the
reader know how each sentence relates to the story and how parts of sentences are related. They indicate your thinking. Without transitions, the logical relationship within a sentence and between sentences is destroyed.

For additional tips on revising your prose (and lots of examples), see: Derish PA, Eastwood SA Clarity Clinic for Surgical Writing. *Journal of Surgical Research* 2008;147:50-58 at the following link [http://www.sciencedirect.com/science/article/pii/S0022480407004039](http://www.sciencedirect.com/science/article/pii/S0022480407004039). For editing help, see section G. If you are a non-native speaker of English, you can find grammar help here: [http://owl.english.purdue.edu/owl/resource/678/01/](http://owl.english.purdue.edu/owl/resource/678/01/)

**D. PUBLICATION ETHICS**

**Plagiarism & Proper Citation of References**

Plagiarism qualifies as a form of scientific misconduct, but many scientific authors don’t know enough about this important issue.

“Approximately 25% of the total allegations received by the DHHS Office of Research Integrity concern plagiarism, and *these allegations typically represent misunderstandings of what exactly constitutes plagiarism and accurate citation procedures.*”


Authors often don’t realize it, but “text recycling” is a form of self-plagiarism” that is considered plagiarism by many journals and funding agencies. Also considered plagiarism is a practice called “patch writing” or “patchworking”, in which a writer copies passages from one or more sources *directly*, but combines them (hence, the “patchwork”), maybe changing some words or phrases, but without citing the sources. The problem of plagiarism has led many journals and funding agencies to routinely use plagiarism detection software.

Whether you are a postdoc or head of a lab, be well informed about what plagiarism is and how to avoid it:

- Annesley TM. Giving Credit: Citations and References. *Clinical Chemistry* 2011;57:14–17: [http://www.clinchem.org/content/57/1/14.full](http://www.clinchem.org/content/57/1/14.full)
- Markin K. Plagiarism in Grant Proposals:
For ESL writers in particular, I suggest this excellent resource:

- [http://owl.english.purdue.edu/owl/resource/958/01/](http://owl.english.purdue.edu/owl/resource/958/01/)

Be aware of UCSF’s policies:

- **University of California Statement of Ethical Values:**
  The University prohibits research misconduct. Members of the University community engaged in research are not to: fabricate data or results; change or knowingly omit data or results to misrepresent results in the research record; or intentionally misappropriate the ideas, writings, research, or findings of others.

- **UCSF Integrity of Research Academic Administrative Policy (100-29):**
  Definition of research misconduct: fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results. Research misconduct does not include honest error or differences of opinion.

- **UCSF Definition of Plagiarism:**
  “the appropriation of another person’s words, ideas or research results without acknowledgement, and passing them off as one's own.”

- **UCSF Procedures for Investigating Allegations of Misconduct:** [http://compliance.ucsf.edu/](http://compliance.ucsf.edu/)

### Authorship (Criteria, Disputes)

Authorship problems have an incredibly long history in science.

**Familiarize yourself with the criteria for authorship** set by the International Committee on Medical Journal Editors, which are followed by > 500 biomedical journals: [http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html](http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html)

Most journals ask for **justification for authorship** in written form, whereby the role of each author is listed, for example²:

**Author Contributions:**

Dr Jackson had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

- Study concept and design: Jackson, Kuriyama, Hayashino.
- Acquisition of data: Jackson, Kuriyama, Hayashino.
- Analysis and interpretation of data: Jackson.
- Drafting of the manuscript: Jackson.
- Critical revision of the manuscript for important intellectual content: Jackson, Kuriyama, Hayashino.
- Statistical analysis: Jackson.
- Study supervision: Hayashino.

² Source: JAMA 2012 Apr 25;307(16):1736-45
Some great references to read now or refer to in the future:


**Ghostwriting**

Articles drafted (or ghosted) by industry with minimal involvement from “guest” authors seem to be in the news on a regular basis, not in a good way. Many medical journals have tightened their policies requiring authors to disclose industry funding and writing assistance. To learn more, see the following:

- The Corporate Coauthor
- The Haunting of Medical Journals: How Ghostwriting Sold “HRT”

**E. PUBLISHING AND PEER REVIEW**

How the peer review process works at the journal and how to communicate with journal editors:

- Vanderbilt University’s Center for Science Communication provides an overview, a powerpoint presentation and sample cover letters: [https://medicine.mc.vanderbilt.edu/sciencecommunication_journaleditors](https://medicine.mc.vanderbilt.edu/sciencecommunication_journaleditors)

Be aware of “predatory open access publishers”

Academic scientists frequently receive email invitations to publish their work in journals they’ve never heard of. I suggest being careful about agreeing to send a manuscript to such journals because many are operated by scholarly vanity presses, essentially a scam in which “publication” in a bogus open access journal takes place, often without any actual peer review, in exchange for author fees. The more articles such predatory publishers publish, the more money they make. These publishers are abusing the “legitimate” open access publishing system, which involves author or institutional fees, but does so with full peer review. To learn more (and to see a listing of predatory publishers): [http://chronicle.com/blogs/brainstorm/on-predatory-publishers-a-q-a-with-jeffrey-beall/47667](http://chronicle.com/blogs/brainstorm/on-predatory-publishers-a-q-a-with-jeffrey-beall/47667) AND see UCSF Library information: [http://www.library.ucsf.edu/services/scholpub/oa/assess](http://www.library.ucsf.edu/services/scholpub/oa/assess)
How to be a good peer reviewer:

- Annesley T. Seven Reasons Not to Be a Peer Reviewer—And Why These Reasons Are Wrong. Clinical Chemistry 2012, 58:4, 677-679: [http://www.clinchem.org/content/58/4/677.full](http://www.clinchem.org/content/58/4/677.full)
- Annesley T. Now You Be the Judge. Clinical Chemistry, 2012, 58:11, 1520-1526: [http://www.clinchem.org/content/58/11/1520.full](http://www.clinchem.org/content/58/11/1520.full)
- Hoppin FG, How I Review an Original Research Article. Am J Respir Crit Care Med 2002,166:8, 1019-1023: [https://vpn.ucsf.edu/content/166/8/,DanalInfo=ajrccm.atsjournals.org+1019.long](https://vpn.ucsf.edu/content/166/8/,DanalInfo=ajrccm.atsjournals.org+1019.long)
- Benos DJ et al. How to Peer Review a Paper. Adv Physiol Educ 2003, 22:7, 47-52: [https://vpn.ucsf.edu/content/27/2/,DanalInfo=advan.physiology.org+47.long](https://vpn.ucsf.edu/content/27/2/,DanalInfo=advan.physiology.org+47.long)

F. GRANT PROPOSALS

A successfully funded proposal is far more than a piece of writing. It’s often the culmination of months of preparation. It’s well worth spending a few hours learning more about the grant writing and review process. You will save yourself time and grief. I highly recommend the resources listed here, but be sure to refer back to part C of this Guide when it’s time to revise your prose.

WATCH:
Northwestern University’s Bioscience Program:
[http://www.northwestern.edu/climb/resources/written-communication/nih-grant-and-dissertation-proposals.html](http://www.northwestern.edu/climb/resources/written-communication/nih-grant-and-dissertation-proposals.html) The link takes you to videos that will give you guidance about how you should approach writing key sections of such proposals. Two videos are devoted to the all important aims page.

ATTEND:
The Department of Surgery’s Scientific Writing Course includes sessions on writing grant proposals—[http://sciencepubs.surgery.ucsf.edu/scientific-writing-course.aspx](http://sciencepubs.surgery.ucsf.edu/scientific-writing-course.aspx). Workshops for Residents on grant writing are given annually.

UCSF’s Office of Career and Professional Development hosts a workshop series on grant writing and a “Preparing Future Faculty” series throughout the year. Sign up on their listserv to receive announcements: [http://career.ucsf.edu/node/584](http://career.ucsf.edu/node/584).

UCSF’s Training in Clinical Research (TICR) Program offers a grant writing course… take the course (click “schedule” to find the next offering). A previous TICR course focused just on K grants had terrific resources that are still available: powerpoints and examples

READ:

Excellent articles for understanding the grant process from beginning to end:
• Brock MV and Bouvet M. Writing a successful NIH mentored Career Development Grant (K Award). *Annals of Surgery*, 2010; 251: 1013-1017.


*For NIH grants specifically, I recommend this good resource that has detailed tips and examples for preparing a new NIH proposal:*


*Essential article for writing clinical proposals: (includes several real examples—clinical examples are very hard to locate so that’s why this article is “essential”):*


*Within the NIH itself, I’ve found the best materials come from one institute—the NIAID—but these materials are useful for all researchers, regardless of whether the NIAID is where you’ll be sending your proposal: [http://www.niaid.nih.gov/researchfunding/grant/strategy/pages/default.aspx](http://www.niaid.nih.gov/researchfunding/grant/strategy/pages/default.aspx)*

**FIND EXAMPLES:**
The best examples come from mentors and colleagues who are willing to share their successful proposals with you, but two additional sources can be helpful:

• Examples of NIH K08, K23 and K24 grant applications: [http://ctsi.ucsf.edu/training/grants-library](http://ctsi.ucsf.edu/training/grants-library)

• Examples of NIH RO1s and R21s: [http://funding.niaid.nih.gov/researchfunding/grant/pages/appsamples.aspx#titlabs](http://funding.niaid.nih.gov/researchfunding/grant/pages/appsamples.aspx#titlabs)

*Plagiarism is not allowed in grant proposals and the cost can be high. Follow the advice given here:*


**G. SCIENTIFIC TALKS AND POSTERS**

**READ AND WATCH**

• Designing Effective Presentations (Excellent 42-minute video covering how to design PowerPoint slides and structure the talk itself)
  Susan McConnell, Stanford University
  [http://www.youtube.com/watch?v=Hp7Id3Yb9XQ](http://www.youtube.com/watch?v=Hp7Id3Yb9XQ)

• Giving a Good Talk (50 minute video; points summarized in short article, emphasizes talk delivery)
  Uri Alon, Weizmann Institute of Science
• How to Give a Scientific Talk (short article, great sense of humor and great advice)  
  Andrew Murray, Harvard Medical School  
  https://pages.wustl.edu/files/pages/imce/haswell/how_to_give_a_science_talk.pdf

• Scientifically Speaking. Tips for Preparing and Delivering Scientific Talks and Using Visual Aids  
  (28-page booklet)  
  The Oceanography Society  
  http://www.tos.org/pdfs/sci_speaking.pdf

• Career Development Guide: Communicating Science-Giving Talks (64-page guide)  
  Burroughs Wellcome Fund  

PRACTICE
To deliver a research talk that has a clear message and will engage your audience, sign up to give a “practice talk” and get feedback from UCSF’s Career and Professional Development Program, or download materials you can use to practice in your own group:  
  http://career.ucsf.edu/grad-students-postdocs/presenting/talks

POSTERS
Get excellent tips from UCSF’s CTSI: http://accelerate.ucsf.edu/about/poster-instructions and from UCSF’s Career and Professional Development Program: http://www.career.ucsf.edu/grad-students-postdocs/presenting/posters

H. CVS AND PERSONAL STATEMENTS (RESIDENTS & POSTDOCS ONLY)

If you need help preparing your CV and personal statement to apply for a fellowship position (residents) or faculty position (postdocs), you can find many examples here:

Residents: http://www.career.ucsf.edu/medical-students/residency-search/cvs-resumes-cover-letters  
  note that these samples are really geared for medical students, so you definitely have to tweak things accordingly

Postdocs: http://www.career.ucsf.edu/grad-students-postdocs/career-planning/academic-jobs/applying/application-materials

More help: If you’d like to work with me individually, contact me at Pamela.Derish@ucsfmedctr.org.

I. EDITING HELP AND WRITING COURSE

The Department of Surgery’s Scientific Publications Office offers an intensive scientific writing course twice a year. For details see: http://sciencepubs.surgery.ucsf.edu/scientific-writing-course.aspx

Faculty can request a special workshop for their lab or research group on specific topics.

Editorial review is available for Department of Surgery faculty, postdoctoral fellows, and residents:  
For questions about this writing resource guide, further resources, or other scientific writing and publishing-related matters, contact me:

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