

# How to Write a Science Paper

- (1) Prepare the figures and tables and organize them to tell the primary narrative.

**Table 1** often includes **characteristics of the population** being studied, relative to the question of interest. For example, if studying the frequency of a genomic/pathologic phenotype in a study population, it might make sense to describe the population with respect to race, age, and other clinical variables (rows), with columns representing grade or molecular subtype. Goal: elucidate any dependencies in the data that inform analytic strategies.

**Figure 1** is usually the **key and most influential outcome** of the paper. Sometimes this means showing the recurrence results that occurred after training several models. Sometimes this means showing how recurrence models were trained.

**Methods Figures** are sometimes allowed and depending on the ordering of the journal, these could occur prior to the Figure 1. Here you would show any flow charts for analytic pipelines, example images.

Check the journal requirements for maximum number of figures and look at some relevant, related papers in that journal to evaluate whether the approach you are using aligns with the journal's patterns/culture.

- (2) **Identify the top strengths** of the paper that you wish to highlight throughout. You will need to ensure that these strengths are emphasized in every section that follows.
- (3) Write the **results section** and revise the figures and tables order if needed.

Place the summary of the characteristics of the population in the first paragraph of this section, highlighting any specific associations that inform adjustment strategies. If you are highlighting the strengths of the study population (see point 2), mention these characteristics as the first sentence of results.

Use section headings for each of the major findings. For example, Predicting Recurrence from Genomic and Pathology Variables.

Identify proper nouns that you will use in the paper and use them consistently. For example, if you will say 'combined classifier' never say 'joint classifier'. Decide what you will call things and keep it that way for the entire paper.

- (4) Write the discussion section.

First paragraph is a high-level summary of the major contributions of the work written in the paper. Here you will not use the word 'strengths' but you will try to make sure that all the major contributions that you have identified as strengths are named.

The second paragraph (up to three paragraphs actually) are comparisons to literature. Each paragraph should start with a summary sentence stating what the key comparisons showed and

then be supported by detailed description of the prior work and references. You can organize these comparisons thematically. If there are thoughts that explain discrepancies, include these here.

The third section is strengths and limitations. If there are methodological factors that are unique and that led to the strengths of the paper or if there are factors that limit the impact, state this here.

Finally, given all of the considerations above, end the paper by emphasizing the clinical implications and or research directions that are derived from this work. This is not a rehash of paragraph 1, but an evolution from paragraph 1, informed by the interceding paragraphs and that emphasizes the impact and significance.

#### (5) Write the methods.

Go back to the tables and figures, which may have changed during steps 2-4, iteratively. Make a list of everything you did to obtain those results and everything that was done to obtain the data that you used in your analysis. Order these and create subheadings that group them together. This is your outline. Use references to cover content that has been previously published.

#### (6) Introduction

Introductions are not a good place to review the previous literature. This is better done in the discussion when it can be contextualized in light of the work done in the current manuscript. Therefore, the introduction should be short. Two to three paragraphs max. I recommend the following:

Paragraph 1 (Setting): Describe the clinical or research context for the project. Be specific. Do not start with the number of women who experience breast cancer. If your project is about classifying breast cancer, start with why it's important to classify breast cancer. What will this mean clinically if it is done well? Are there specific populations that need this research?

Paragraph 2 (Plot): What is the key tension/literature gap that the paper will address? You should refer to the strengths of your paper from item 2 and identify all the ways in which the literature was lacking with respect to these strengths.

Paragraph 3: Sometimes combined with paragraph 2 if only a sentence or two, this is a clear statement of the hypothesis and approach for the paper.

#### (7) Abstract

I recommend always starting with a **structured abstract** so you can assess balance. Some journals do not want a structured abstract. For these journals you will delete the structure.

**Introduction/Impact:** Why does the problem matter?

**Methods:** What is the study population and approach?

**Results:** What did you find, and please include point estimates, confidence intervals, and specific details of the findings.

**Conclusion:** Why does the findings change what we understood before and what is the importance of the contribution.

Check it: Check to make sure that the strengths of the paper that you listed in #2 are present. Check you word count to make sure it aligns with the journal and pubmed (250 words).

## **Publishing**

Step 1: Engage with one or more members of the CBCS Steering Committee while developing the research and data to be published.

- Shelley Earp
- Lisa Carey
- Chuck Perou
- Andy Olshan
- Melissa Troester
- Heather Tipaldos

Step 2: Identify your co-authors, i.e., everyone who intellectually contributed to the research's design, production, and interpretation. For the CBCS, review by the Steering Committee will help identify relevant co-authors.

- Consider previous co-authors who were not part of the current project, especially if you reuse any portion(s) of those paper(s).
- Search your co-authors on PubMed and ensure you have used their preferred name and affiliation (i.e., middle initial, centers, and departments).

Step 3: Proofread your article.

Step 3a: Check the main text, references, tables, and figures for correctness.

Step 3b: Confirm that author list has not changed. Add the names of those who have provided meaningful intellectual and/or technical input.

Step 3c: Check the order of authors corresponds to their relative contributions to the research and article, save for the PI who appears last.

Step 3d: Confirm accuracy of co-authors' names and affiliations.

Step 3e: Ensure that your abstract remains a complete distillation of the paper.

Step 4: Write additional materials for your paper.

Step 4a: Draft acknowledgements. Include funding sources and, if applicable, gratitude to non-authorial contributors (e.g., research technicians and assistants, participants) &/or copyright holders of any reproduced material. For CBCS, use the acknowledgement at <https://unclineberger.org/cbcs/for-researchers/acknowledgements/>.

Remember to cite any training grants with which you were involved. Possible examples include CCEP, Environmental Training Grant, Komen Graduate Training in Disparities Research Grant, etc.

Step 4b: Draft disclosures. Declare presence or lack of authorial conflict(s) of interest and whether author(s) have related projects published (or under consideration) elsewhere.

If PAM50 data points are included, indicate that UNC holds an interest in University Genomics, the patent-holder for the Prosigna assay. The standard disclosure is at <https://unclineberger.org/cbcs/for-researchers/acknowledgements/>.

If they ask for an ethics declaration, please use:

The study was approved by the University of North Carolina Institutional Review Board in accordance with U.S. Common Rule. All study participants provided written informed consent prior to study entry. This study complied with relevant ethical regulations, including the Declaration of Helsinki.

Step 5: Submit the article for CBCS Steering Committee review and approval. Fill out the CBCS submission Qualtrics: [https://unc.az1.qualtrics.com/jfe/form/SV\\_3dw3GCvjc4NGeeG](https://unc.az1.qualtrics.com/jfe/form/SV_3dw3GCvjc4NGeeG)

Step 5a: If necessary, revise and resubmit your article to the Steering Committee for final approval.

Step 6: Double-check that you followed every detail of the journal's manuscript formatting guidelines. Upon approval granted by Steering Committee, submit your article and cover letter.

Step 7: Complete the PMCID process within 90 days of publication.

This is only required if the publication has NIH funding and if the journal does not do it for you. (Technically, the submission to NIHMS is always the responsibility of the author.)

## PMCID Checklist

Visit [https://publicaccess.nih.gov/submit\\_process.htm](https://publicaccess.nih.gov/submit_process.htm) for an explanation of the various submission methods.

To determine your method, visit [https://publicaccess.nih.gov/submit\\_process\\_journals.htm](https://publicaccess.nih.gov/submit_process_journals.htm). For tutorials, visit <https://www.nihms.nih.gov/help/tutorials/>.

What you Need to Start:

Final peer-reviewed manuscript, accepted for publication after April 7, 2008, which resulted (at least in part) from NIH funding or CCSG support NIH, eRA Commons, or My NCBI log-in

Grant number(s) attached to article: \_\_\_\_\_

Journal-mandated embargo dates: \_\_\_\_\_

Step 1: Sign into NIHMS ([www.nihms.nih.gov](http://www.nihms.nih.gov)), and select the “Submit New Manuscript” button.

Step 2: Add the Title Information by selecting “Search for Citation” in PubMed.

(Searching by the PMID is critical. This will attach the PMID to your manuscript, so it will be matched to any duplicate manuscripts.)

Step 3: Select “Add Funding”.

Step 4: Search by the PI’s name or the grant number to add funding.

Step 5: Add any funding sources and associated grants using the “Select” column.

Step 6: Select “Upload Files”.

Step 7: Upload the manuscript files. You can submit the manuscript in one file, or in separate files for each component (manuscript, graphics, etc.)

Step 8: Select “Check Files”.

Step 9: Review the PDF Receipt.

Step 10: Select “Set Reviewer and Embargo”.

Step 11: A selected author will review the submission, set an embargo if required, and select “Approve”.

Step 12: Select “Agree” to finalize your approval.

Step 13: Choose your designee; provide the author’s name and e-mail address, then select “Send to Reviewer”.

Step 14: The manuscript submission will now have a NIHMS ID; this ID number will be useful until the PMCID is assigned. You can submit the NIHMS ID to your MyNCBI MyBibliography to show that your publication is compliant.

Step 15: The reviewer will receive an e-mail and must confirm or reject the submission to NIHMS.

Step 16: After the submission has been confirmed, the NIHMS Staff will review and approve the files for completeness. This can take 2-3 weeks.

Step 17: The designated reviewer will receive an e-mail to approve the final Web version of the submission.

Step 18: You will receive an email including your PMCID.

## **Additional FAQs**

QUESTION: Do you declare that authorization has been given to use any information conveyed by either personal communication or release of unpublished experimental data?

ANSWER: Yes