

EDITORIAL

How We Write a Manuscript Discussion

THE ART AND HABIT OF SCIENTIFIC WRITING

Sharing and interpreting research results thoughtfully and accurately is critical to advancing science, and perhaps as important as conducting the research. The art of scientific publishing can be perfected through intentional practice. Different strategies can be employed to make time for manuscript writing:

1. Allocate scheduled time each day for writing. This builds a habit for writing. It also helps busy people to avoid procrastination and time crunches imposed by preferring small tasks through each day to complex tasks like writing. It also keeps motivation up.¹
2. Another approach is to block certain days to write. Longer time spent to concentrate on the manuscript can help maintain the flow and thought process, but for some people it may be boring and lead to loss of motivation. For a physician scientist, it may be impossible to allocate long periods of time at once due to ongoing demands from clinical work. The situation can be similar for fundamental scientists as they navigate managing their labs and often supervise more trainees.
3. Write on the weekends. Depending on one's situation, non-standard workdays may be the only time available to write without interruption. The setting might be more comfortable too – this piece was partly written on a Saturday morning sitting in a comfy leather chair!

Of course, only you can develop a strategy that works best, and most people probably employ a combination of these approaches.

PUTTING IT ALL TOGETHER: WRITING THE DISCUSSION

The objective of a manuscript Discussion section is to share the study findings in an easy and comprehensible format. Three things are important in scientific writing: simplicity, clarity and effectiveness. By the time a reader reaches Discussion section, the authors have already

introduced the purpose of the study and provided an in-depth description of methodology and results. The needed elements of the Discussion are:

- Summarize key findings of the study
- Compare and contrast results with previous studies and discuss related research
- Highlight strengths and limitations of the study
- Discuss unanswered questions, potential future research and implications

The Discussion section should focus on larger implications of the study in the context of known research.² This could be the hardest part; highlighting implications while not overstating the findings can be challenging. That said, a little speculation is okay if it is stated as such.

While RPTH is flexible on word count restrictions, shorter articles will always fare better in peer review. The Discussion section is not a Review Article, and it should focus on the most important aspects of the research. Figure 1 summarizes key advice to consider when writing a Discussion. In addition, it can be helpful to ask a colleague who is not an expert on your topic to read your Discussion for understandability.

As illustrated in Figure 2, the Discussion section can be organized into three parts: an introductory or first paragraph, middle paragraphs, and a conclusion paragraph.³

The First Paragraph

The first paragraph succinctly summarizes key study findings and reminds the reader about the importance of the study. It should not reiterate the hypothesis and objectives of the study, which are found in the Introduction. A clear and concise introductory paragraph grabs the reader's attention and sets the stage for an in-depth discussion. We suggest beginning with language like, "The main findings of this study are". Provide just a few sentences and only repeat minimal numerical results that relate to the key message. If you believe it is important to claim to be the first to report something, qualify this to

The Discussion section is a critical part of a manuscript as it articulates the results, their relationship to existing literature, study limitations that require consideration, and implications of the research. It can also be the most challenging part of writing a manuscript, especially for early-stage investigators who are new to scientific publishing and those whose native language is not English. Academic writing is similar to other skills and practice can make it perfect. Here, we offer suggestions for writing an effective Discussion and point out issues often seen at Research and Practice in Thrombosis and Haemostasis (RPTH).

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Keep it Simple	Organize Data	Don't Re-write Results	Be Concise	Some Tips
<ul style="list-style-type: none"> Avoid excessive jargon and unnecessary words. Pet peeve of this editor is "has been shown to be" instead of just "is" Abbreviations can distract readers Avoid use of pompous language 	<ul style="list-style-type: none"> Organize interpretations into sub-headings for easy readability Follow a logical sequence Start with key findings first Perform a thorough literature review Provide clear message of the manuscript 	<ul style="list-style-type: none"> Don't extensively repeat results, especially numeric values Avoid repetitive statements Don't over-interpret results Speculate only if you have reasonable explanations 	<ul style="list-style-type: none"> Avoid long paragraphs Readers do not want to plow through yards of text to get to the message First sentence of each paragraph should introduce the paragraph Shorter articles always fare better in peer review 	<ul style="list-style-type: none"> Keep the tense of writing the same throughout the manuscript Past tense is preferred by most readers Avoid repetitive use of the words "we" and "our"; authors don't 'own' studies or participants, for example

FIGURE 1 General Advice for Writing the Discussion.

say you are the first you are aware of. Then repeat your literature search prior to submission (and resubmissions) to confirm this. Another way to express being first is to say you didn't find any other studies on the topic, without referring to being the first.

on the topic of the manuscript, so a discussion highlighting current evidence and gaps in knowledge that provide context for the study can make peer review easier. It is the responsibility of authors to provide this information in a simple and concise format to make it easy for the reviewers.

The Middle Paragraphs

There are usually 4-5 middle paragraphs which provide an opportunity to be creative and craft the story. After often spending years on their research, reviewers and editors usually have less knowledge than authors

Compare and Contrast with the Literature (3-4 paragraphs)

We suggest starting with the most important result of the study and discussing the findings in the context of existing literature,

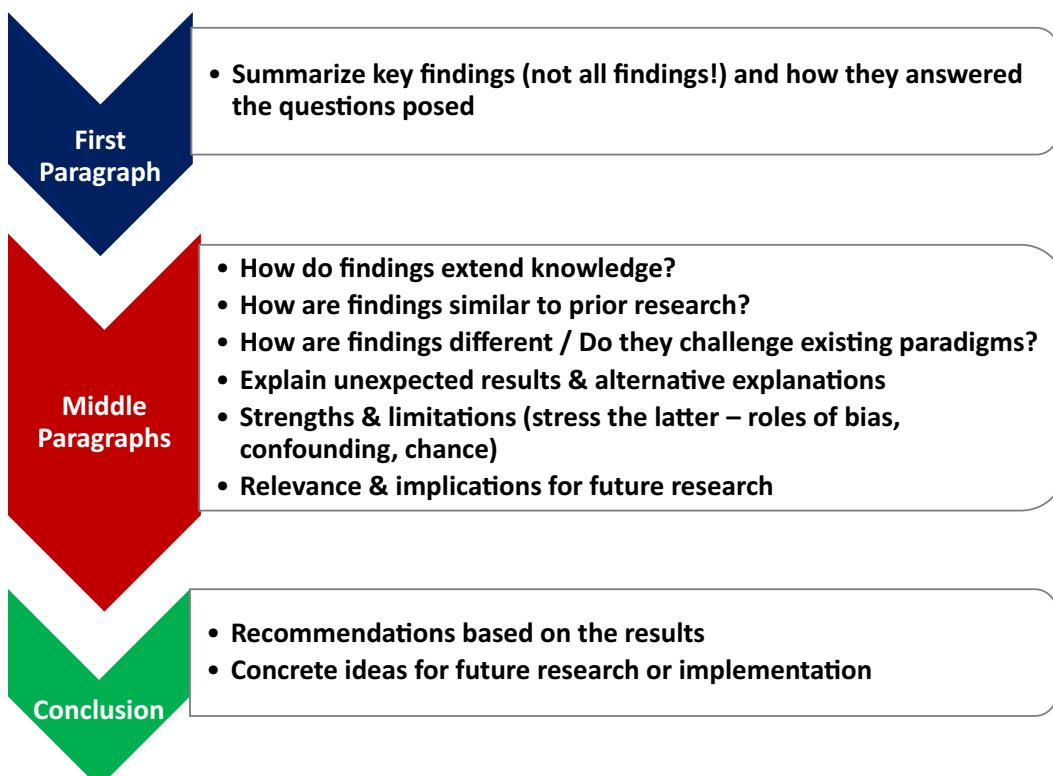


FIGURE 2 Structure of the Discussion.

then moving on to minor findings. Keep in mind that effect sizes are more important than statistical significance. It is helpful to highlight advantages to the interpretation based on the hypotheses tested, study design, and novel methodologies or techniques implemented.

A common pitfall in this section is to preferentially cite studies that concur with the current findings. Don't focus only on findings that align with previous literature. Keep in mind that "negative findings" are important to discuss as they can guide future research. Any unexpected or intriguing findings may be especially important if the results are contrary to prior studies.⁴ The authors should make every effort to acknowledge the differences and offer possible explanations. For example, they can discuss differences in methodology or approaches, sample size, or characteristics of the study population that might have affected results.

Implications (1 paragraph)

Highlight how your research advances the field, introduce new ways to think about the research question, and probe others to think about next steps to further pursue any unsolved questions. Here, the authors can discuss the impact of their research, what they plan to do next, or if relevant, provide suggestions on how to implement the intervention in a particular context.

Strengths and Limitations (1 paragraph)

While discussing strengths of a study is important, potential limitations merit extensive attention.⁵ For clinical and population research at RPTH, the most frequent problem we see is inadequate attention to limitations. If these are ignored your manuscript may be rejected. The role of many types of bias, uncontrolled confounding, and chance on interpretation of the findings must each be thoroughly discussed; remember, BIAS, CONFOUNDING, and CHANCE! In discussing bias, indicate the direction a particular bias may have had on results (i.e., to the null or more extreme). In clinical research studies submitted to RPTH, we frequently see that information on socio-demographics (such as race or ethnicity) is often not collected or considered, and implications of this omission on generalizability of findings must be discussed.

The Conclusion Paragraph

A strong ending is important as this leaves the reader with main takeaways from the study and how it contributes to the field. Here, the authors should discuss the significance, overall conclusion, and any major impacts of the study.

Common Mistakes

1. *Lack of clear message:* This is a common problem when authors try to include multiple ideas concurrently or summarize numerous unrelated results concurrently. This leads to lack of focus. This may be more common with early career authors who are trying to be exhaustive. It is a good idea to prioritize the main objectives of the study and to assess if the article is clearly conveying answers for each of the objectives. Use of templates which contain intended clear-cut messages can also help in communicating the message directly. Authors should be cautious not to include unnecessary information that will distract from the main findings of the research.
2. *Refraining from critical review of the results:* Avoid too much focus on the positive aspects and strengths of the study.⁶ Don't exaggerate the importance of the study findings. The Discussion must exhaustively cover study limitations. It is a great idea to discuss whether your results prove or disprove your hypothesis and provide reasons. Discussing limitations in methods, need for replication, potential bias, and barriers to implementation of any studied intervention are great ways to direct future research.
3. *Incomplete literature review:* While novice investigators may eliminate some critical citations due to lack of knowledge, sometimes senior researchers also oversee this and tend to self-cite. New research may be left uncited if there is a significant time lapse from conception of the study to manuscript preparation, so authors should always repeat a literature search before submitting or resubmitting the paper to review any new pertinent publications. Also, when there are updated guidelines, the authors should make sure to cite the most recent version.

CONCLUSION

We hope that this article helps readers write a better Discussion. For other articles on improving your scientific writing and impact of your research, refer to past editorials published in RPTH.

CONFLICT OF INTEREST STATEMENT

The authors have no relevant disclosures related to this manuscript.

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REFERENCES

- 1 Şanlı Ö, Erdem S, Tefik T. How to write a discussion section? *Turk J Urol.* Sep 2013;39(Suppl 1):20–4. <https://doi.org/10.5152/tud.2013.049>
- 2 Foote M. The proof of the pudding: how to report results and write a good discussion. *Chest.* Mar 2009;135(3):866–8. <https://doi.org/10.1378/chest.08-2613>
- 3 Ghasemi A, Bahadoran Z, Mirmiran P, Hosseinpanah F, Shiva N, Zadeh-Vakili A. The Principles of Biomedical Scientific Writing: Discussion. *Int J Endocrinol Metab.* Jul 2019;17(3):e95415. <https://doi.org/10.5812/ijem.95415>
- 4 Liumbruno GM, Velati C, Pasqualetti P, Franchini M. How to write a scientific manuscript for publication. *Blood Transfus.* Apr 2013;11(2):217–26. <https://doi.org/10.2450/2012.0247-12>
- 5 Ioannidis JP. Limitations are not properly acknowledged in the scientific literature. *J Clin Epidemiol.* Apr 2007;60(4):324–9. <https://doi.org/10.1016/j.jclinepi.2006.09.011>
- 6 Walsh K. Discussing discursive discussions. *Med Educ.* Dec 2016;50(12):1269–70. <https://doi.org/10.1111/medu.13103>