

How to write an original research paper (and get it published)

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DOI: <http://dx.doi.org/10.3163/1536-5050.103.2.001>

The purpose of the *Journal of the Medical Library Association (JMLA)* is more than just archiving data from librarian research. Our goal is to present research findings to end users in the most useful way. The "Knowledge Transfer" model, in its simplest form, has three components: creating the knowledge (doing the research), translating and transferring it to the user, and incorporating the knowledge into use. The *JMLA* is in the middle part, transferring and translating to the user. We, the *JMLA*, must obtain the information and knowledge from researchers and then work with them to present it in the most useable form. That means the information must be in a standard acceptable format and be easily readable.

There is a standard, preferred way to write an original research paper. For format, we follow the IMRAD structure. The acronym, IMRAD, stands for Introduction, Methods, Results And Discussion. IMRAD has dominated academic, scientific, and public health journals since the second half of the twentieth century. It is recommended in the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" [1]. The IMRAD structure helps to eliminate unnecessary detail and allows relevant information to be presented clearly in a logical sequence [2, 3].

Here are descriptions of the IMRAD sections, along with our comments and suggestions. If you use this guide for submission to another journal, be sure to check the publisher's prescribed formats.

Introduction

The *Introduction* sets the stage for your presentation. It has three parts: what is known, what is unknown, and what your burning question, hypothesis, or aim is. Keep this section short, and write for a general audience (clear, concise, and as nontechnical as you can be). How would you explain to a distant colleague why and how you did the study? Take your readers through the three steps ending with your specific question. Emphasize how your study fills in the gaps (the unknown), and explicitly state your research question. Do not answer the research question. Remember to leave details, descriptions, speculations, and criticisms of other studies for the *Discussion*.

Methods

The *Methods* section gives a clear overview of what you did. Give enough information that your readers

can evaluate the persuasiveness of your study. Describe the steps you took, as in a recipe, but be wary of too much detail. If you are doing qualitative research, explain how you picked your subjects to be representative.

You may want to break it into smaller sections with subheadings, for example, context: when, where, authority or approval, sample selection, data collection (how), follow-up, method of analysis. Cite a reference for commonly used methods or previously used methods rather than explaining all the details. Flow diagrams and tables can simplify explanations of methods.

You may use first person voice when describing your methods.

Results

The *Results* section summarizes what the data show. Point out relationships, and describe trends. Avoid simply repeating the numbers that are already available in the tables and figures. Data should be restricted to tables as much as possible. Be the friendly narrator, and summarize the tables; do not write the data again in the text. For example, if you had a demographic table with a row of ages, and age was not significantly different among groups, your text could say, "The median age of all subjects was 47 years. There was no significant difference between groups (Table)." This is preferable to, "The mean age of group 1 was 48.6 (7.5) years and group 2 was 46.3 (5.8) years, a nonsignificant difference."

Break the *Results* section into subsections, with headings if needed. Complement the information that is already in the tables and figures. And remember to repeat and highlight in the text only the most important numbers. Use the active voice in the *Results* section, and make it lively. Information about what you did belongs in the *Methods* section, not here. And reserve comments on the meaning of your results for the *Discussion* section.

Other tips to help you with the *Results* section:

- If you need to cite the number in the text (not just in the table), and the total in the group is less than 50, do not include percentage. Write "7 of 34," not "7 (21%)."
- Do not forget, if you have multiple comparisons, you probably need adjustment. Ask your statistician if you are not sure.

Discussion

The *Discussion* section gives you the most freedom. Most authors begin with a brief reiteration of what they did. *Every* author should restate the key findings and answer the question noted in the *Introduction*. Focus on what your data prove, not what you hoped they would prove. Start with “We found that...” (or something similar), and explain what the data mean. Anticipate your readers’ questions, and explain why your results are of interest.

Then compare your results with other people’s results. This is where that literature review you did comes in handy. Discuss how your findings support or challenge other studies.

You do not need every article from your literature review listed in your paper or reference list, unless you are writing a narrative review or systematic review. Your manuscript is not intended to be an exhaustive review of the topic. Do not provide a long review of the literature—discuss only previous work that is directly pertinent to your findings. Contrary to some beliefs, having a long list in the *References* section does not mean the paper is more scholarly; it does suggest the author is trying to look scholarly. (If your article is a systematic review, the citation list might be long.)

Don’t overreach

Do not overreach your results. Finding a perceived knowledge need, for example, does not necessarily mean that library colleges must immediately overhaul their curricula and that it will improve health care and save lives and money (unless your data show that, in which case give us a chance to publish it!). You can say “has the potential to,” though.

Always note limitations that matter, not generic limitations.

Point out unanswered questions and future directions. Give the big-picture implications of your findings, and tell your readers why they should care. End with the main findings of your study, and do not travel too far from your data. Remember to give a final take-home message along with implications.

Notice that this format does not include a separate *Conclusion* section. The conclusion is built into the *Discussion*. For example, here is the last paragraph of the *Discussion* section in a recent *NEJM* article:

In conclusion, our trial did not show the hypothesized benefit [of the intervention] in patients...who were at high risk for complications.

However, a separate *Conclusion* section is usually appropriate for abstracts. Systematic reviews should have an *Interpretation* section.

Other parts of your research paper independent of IMRAD include:

Tables and figures are the foundation for your story. They are the story. Editors, reviewers, and readers usually look at titles, abstracts, and tables and figures first. Figures and tables should stand alone

and tell a complete story. Your readers should not need to refer back to the main text.

Abstracts can be free-form or structured with subheadings. Always follow the format indicated by the publisher; the *JMLA* uses structured abstracts for research articles. The main parts of an abstract may include introduction (background, question or hypothesis), methods, results, conclusions, and implications. So begin your abstract with the background of your study, followed by the question asked. Next, give a quick summary of the methods used in your study. Key results come next with limited raw data if any, followed by the conclusion, which answers the questions asked (the take-home message).

Tips

- Recommended order for writing a manuscript is first to start with your tables and figures. They tell your story. You can write your sections in any order. Many recommend writing your *Results*, followed by *Methods*, *Introduction*, *Discussion*, and *Abstract*.
- We suggest authors read their manuscripts out loud to a group of librarians. Look for evidence of MEGO, “My Eyes Glaze Over” (attributed to *Washington Post* publisher Ben Bradlee and others). Modify as necessary.
- Every single paragraph should be lucid.
- Every paragraph should answer your readers’ question, “Why are you telling me this?”

All sizes welcome

The *JMLA* welcomes all sizes of research manuscripts: definitive studies, preliminary studies, critical descriptive studies, and test-of-concept studies. We welcome brief reports and research letters. But the *JMLA* is more than a research journal. We also welcome case studies, commentaries, letters to the editor about articles, and subject reviews.

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