

How to Write a Scientific Article: A Practical, Step-by-Step Guide for Researchers

A detailed scientific blog based on Ecarnot et al. (2015)

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Scientific research does not end when experiments are completed. A study becomes part of the scientific record only when its rationale, methods, evidence, interpretation, and contribution are communicated clearly enough for other researchers to understand, evaluate, reproduce, and build upon it. This article presents a practical framework for turning research work into a coherent scientific manuscript, with particular emphasis on the IMRAD structure, the logic of each section, scientific precision, and publication readiness.

1. Why Scientific Writing Is a Research Skill

Researchers often experience scientific writing as difficult because they are deeply involved in their own projects. After investing substantial time, effort, and resources, it is natural to become convinced of the importance of the work. That involvement can, however, make it harder to step back and present the study from the reader's perspective. The source emphasizes that a manuscript should be understandable not only to specialists but also, where appropriate, to readers outside the immediate research niche.

Publication is also important for academic development, funding, qualifications, and career progression. Because journals receive many strong submissions, scientific merit alone is not always enough: poor organization, unclear presentation, weak writing, or confusing data presentation can prevent good research from being evaluated fairly.

2. The Most Important Principle: Writing Starts Before Writing

A strong manuscript is usually built on preparation that occurred before the first sentence was drafted. The article recommends completing the scientific groundwork—including protocol development, literature review, analysis, and identification of important findings—before beginning the manuscript.

Use the literature review to establish the current state of knowledge, identify uncertainty, and determine whether the planned research is original. During reading, record useful ideas together with their exact references rather than trying to reconstruct the bibliography later.

The final statistical analysis should provide the foundation for the Results section. Important graphical representations should be identified early because they may become figures in the final paper.



Select the target journal before writing the manuscript. Journal scope, readership, formatting requirements, article type, and editorial preferences influence both the amount of information required and the style in which it should be presented.

3. The IMRAD Architecture

The source identifies IMRAD—Introduction, Methods, Results, and Discussion—as the most widely used structure for scientific articles, while noting that individual journals may use variations. A complete manuscript normally also includes a title, abstract, references, tables, figure legends, and, where required, acknowledgements, conflict-of-interest statements, and author-contribution information.

Section	Core question	Primary function
Introduction	Why was the study needed?	Build the rationale, identify the knowledge gap, state the hypothesis/objectives.
Methods	What exactly was done?	Provide enough information for understanding and reproducibility.
Results	What was observed?	Report findings objectively without interpretation.
Discussion	What do the findings mean?	Interpret significance, compare with literature, address implications and limitations.
Abstract	What is the study in miniature?	Provide a stand-alone summary of background, methods, main results and conclusion.
Title	What is the paper about?	Identify the main topic, context and contribution using searchable keywords.

4. Building a Strong Introduction

The Introduction is the manuscript's logical entry point. Its purpose is not to provide an encyclopedic review but to guide the reader from established knowledge toward the specific problem addressed by the study. A strong Introduction should answer four connected questions: What is already known? What remains uncertain? What specific gap does the study address? What did the researchers aim to determine?

1. Start with a concise, evidence-based background.
2. Narrow the discussion toward the unresolved issue or uncertainty.
3. Identify the explicit knowledge gap that justifies the study.
4. State the working hypothesis where appropriate.
5. State the primary objective clearly and precisely.
6. Briefly indicate the strategy used to address the objective.

The source stresses consistency: the objective should be formulated carefully and then expressed using the same terminology throughout the Introduction, Methods, Results, Discussion, Abstract, and, where



appropriate, the title. Consistent terminology reduces ambiguity and helps the reader follow the study's central question.

5. The Methods Section: Making Research Reproducible

The Methods section should tell the reader exactly what was done and how it was done. Its central test is reproducibility: a suitably qualified reader with comparable resources should be able to understand and, where applicable, reproduce the study from the description.

Specify the design and justify unusual methodological choices when necessary.

Define what or whom was studied and provide relevant inclusion/non-inclusion criteria or selection procedures.

Describe every major measurement, intervention, analytical technique, or procedure required to understand the reported results.

Identify the main outcome and other planned outcomes. The primary endpoint is especially important because it underpins formal conclusions.

Where relevant, provide manufacturer information and sufficient technical detail for important equipment, tests, or specialized procedures.

For applicable studies, report ethics approval, informed consent, and registration information as required by the study type and target journal.

Describe data presentation, statistical tests, significance level, software, planned subgroup analyses, and other relevant analytical decisions.

A key consistency rule is that every result should have a corresponding method. Conversely, if a method is presented, the manuscript should make clear what result it generated or why it was included. The source also recommends avoiding unnecessary repetition of methods already fully described in a previous publication when a concise description plus an appropriate citation is sufficient.

6. Writing the Results: Evidence Without Interpretation

The Results section should report what was observed rather than explain why it happened. Methods should not be repeated, and interpretive expressions such as 'surprisingly' or 'interestingly' are generally inappropriate in a strictly written Results section.

A useful organizational principle is to present the Results in the same order as the Methods. This creates a predictable relationship between experimental procedure and evidence. Subheadings can further divide complex results into logical units.



Simple findings that can be stated clearly in one or two sentences can remain in the text. Tables are particularly useful when the same variables must be compared across groups or conditions. Figures are valuable for complex data, relationships, trends, and patterns that are easier to interpret visually. The source cautions against duplicating the same information extensively in prose, tables, and figures.

7. The Discussion: From Findings to Scientific Meaning

The Discussion is where the researcher explains the significance of the results and places them within the broader scientific literature. It should begin with a concise recap of the main finding, preferably using terminology consistent with the objective and primary endpoint.

- Interpret the findings without merely repeating the Results.
- Compare the findings with relevant previous studies.
- Discuss plausible reasons for agreement or disagreement with earlier work.
- Explain the broader significance of the complete set of findings rather than isolated results.
- State what can and cannot reasonably be extrapolated.
- Identify the novel contribution and whether the study fills the stated knowledge gap.
- Discuss practical or scientific implications.
- Identify future research directions.
- State strengths and limitations honestly and explain their implications.

One of the most important warnings in the source is against over-interpretation. A numerical observation should not be transformed into a broader claim that the data do not support. Scientific discussion should preserve the scope and uncertainty of the original evidence.

8. Negative Results Are Still Scientific Results

The source explicitly argues that a well-designed study does not become scientifically useless simply because its findings are negative. Negative or non-confirmatory results can challenge assumptions, refine hypotheses, reinforce conflicting evidence, or redirect future research. The quality of the study design and execution is therefore more important than whether the result is positive.

9. Writing a High-Impact Abstract

The Abstract should function as an independent, stand-alone representation of the paper. It is often the first component encountered by readers and may be the principal text indexed by bibliographic databases. It should therefore be concise but sufficiently informative to communicate the study's rationale, approach, major findings, and conclusion.

Briefly establish the context, problem, and objective; identify the knowledge gap where appropriate.

State the defining study population/material, groups, major interventions or analytical approaches, and primary endpoint.



Give the principal findings with appropriate quantitative information. Results should be sufficient to support the conclusion.

Provide a concise take-home message directly connected to the objective and main finding.

The source advises that an abstract should generally contain no references, figures, tables, or discussion/judgemental commentary.

10. Designing a Searchable and Informative Title

A scientific title has two jobs: it tells readers what the study is about and helps the paper become discoverable in databases. The title should contain the principal keywords and distinguish the study from related literature by communicating its most important aspect or contribution.

- Name the principal intervention, factor, material, or phenomenon studied.
- Identify the relevant population or scientific context when useful.
- Include the study design when it meaningfully distinguishes the work.
- State the principal finding when appropriate and permitted by the journal.
- Place the most important distinguishing aspect early.
- Avoid vague phrases that add no scientific information.
- Use standard scientific names rather than commercial names.
- Keep the title concise and within the target journal's limits.

11. References: Scientific Transparency and Traceability

References are not decoration; they document the intellectual foundation of the study. Ideas, facts, classifications, named concepts, and evidence originating from other sources should be appropriately cited. The source recommends prioritizing peer-reviewed literature and, where possible, original research rather than relying on secondary sources for primary claims.

A particularly important practice is to verify references personally. If a review cites an original study for a particular finding, the researcher should, where possible, consult and cite the original study rather than repeatedly citing the intermediary review. Reference accuracy remains the author's responsibility, and formatting must follow the target journal's instructions.

12. Scientific Language and Tense: Precision Over Ornament

The article provides practical guidance on tense. In general, established knowledge is described in the present tense; previously published observations are commonly described in the past tense; ongoing bodies of research may use the present perfect; hypotheses and study objectives can be expressed in carefully selected past/present constructions; and Methods and Results are predominantly reported in the past tense.



More broadly, scientific writing should prioritize precision, clarity, consistency, and restraint. The goal is not literary complexity. A technically sophisticated result becomes less valuable if the reader cannot determine what was actually measured, observed, or concluded.

13. A Practical Workflow for Writing a Manuscript

- 7. Finish or verify the research protocol and analysis plan.
- 8. Conduct and document the relevant literature review.
- 9. Identify the target journal and study its author instructions.
- 10. Write the central research question, hypothesis, and primary objective in one precise formulation.
- 11. Organize the Methods so that every reported result has a methodological origin.
- 12. Arrange Results in the same logical sequence as Methods.
- 13. Select only the tables and figures that materially improve understanding.
- 14. Write the Discussion around interpretation, comparison, novelty, implications, and limitations.
- 15. Draft the Abstract after the main manuscript is stable.
- 16. Finalize the title so that it accurately reflects the study and contains important searchable terms.
- 17. Audit every reference for accuracy and formatting.
- 18. Ask co-authors or senior researchers to review the manuscript for scientific content and clarity.
- 19. Perform a final consistency check across title, abstract, objectives, methods, results, discussion, figures, tables, and references.

14. Common Problems This Framework Helps Prevent

Problem	What to watch for
Unfocused Introduction	Too much background and no clear transition to the knowledge gap.
Vague objective	The reader cannot identify exactly what parameter, population, or phenomenon was investigated.
Incomplete Methods	The reported experiment or analysis cannot be understood or reproduced.
Results mixed with interpretation	The reader cannot distinguish observation from explanation.
Over-interpretation	The Discussion makes claims broader than the data justify.
Redundant presentation	The same result is unnecessarily repeated in prose, tables, and figures.
Weak title	The main scientific topic and contribution are difficult to identify.
Poor reference practice	Claims are inadequately supported or references are inaccurate.
Inconsistent terminology	The same research objective or endpoint is described using different terms across sections.
Ignoring journal instructions	Formatting, article structure, word limits, or reference style do not match the selected journal.



15. The Central Message for Early-Career Researchers

The strongest message of the source is that scientific writing is not an isolated language exercise performed after research is finished. It is the final stage of a chain that begins with a well-defined question, a carefully planned protocol, an appropriate literature review, rigorous data collection and analysis, and disciplined interpretation. Good preparation makes writing easier because the manuscript is essentially a logical reconstruction of the research process.

A successful paper therefore does more than report data. It creates a transparent argument: the literature establishes what is known; the gap explains why the study was needed; the objective states exactly what was investigated; the Methods establish credibility and reproducibility; the Results provide evidence; the Discussion explains significance without exceeding the evidence; and the Abstract and title make the contribution accessible and discoverable.

16. Final Take-Home Checklist

- Is the research question clearly identifiable?
- Does the Introduction establish a specific knowledge gap?
- Is the objective explicit and consistently worded?
- Can another qualified researcher understand exactly how the study was performed?
- Does every major result correspond to a method?
- Are Results presented without unnecessary interpretation?
- Does the Discussion distinguish evidence from inference?
- Are novelty, significance, limitations, and future directions addressed?
- Does the Abstract stand alone and contain enough quantitative evidence?
- Does the title contain the key scientific terms?
- Are references accurate, relevant, and traceable to original sources where appropriate?
- Does the manuscript comply with the target journal's instructions?

Source Article

Ecarnot, F., Seronde, M.-F., Chopard, R., Schiele, F., & Meneveau, N. (2015). Writing a scientific article: A step-by-step guide for beginners. *European Geriatric Medicine*, 6, 573–579. DOI: 10.1016/j.eurger.2015.08.005.

This blog is a detailed, source-based educational adaptation of the article. It preserves the article's core framework and recommendations while reorganizing them into a practical guide for researchers.