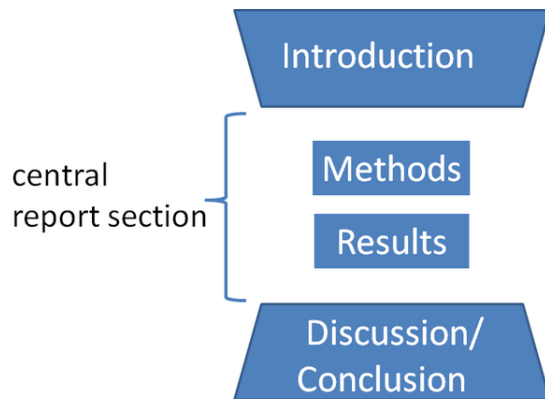


# IMRAD

For a broader coverage related to this topic, see [Scientific article](#).

In scientific writing, **IMRAD** (/ˈɪmræd/) (**introduction, methods, results, and discussion**) refers to a common organization structure. IMRAD is the most prominent norm for the structure of a [scientific journal article](#) of the [original research type](#).

## 1 Overview



*Fig.1: Wineglass model for IMRAD structure. The above scheme schematically shows how to line up the information in IMRAD writing. It has two characteristics, first one is “top-bottom symmetric shape”, second one is “change of width”, that means “the top is wide and it narrows towards the middle, and then widens again as it goes down toward the bottom”. First one, “top-bottom symmetric shape” represents the symmetry of the story development. Second one, the change of the width of above diagram, represents the change of generality of the viewpoint.*

Original research articles are typically structured in this basic order:<sup>[1] [2]</sup>

- Introduction - Why was the study undertaken? What was the [research question](#), the tested [hypothesis](#) or the purpose of the research?
- Methods - When, where, and how was the study done? What materials were used or who was included in the study groups (patients, etc.)?
- Results - What answer was found to the research question; what did the study find? Was the tested hypothesis true?

- and

- Discussion - What might the answer imply and why does it matter? How does it fit in with what other researchers have found? What are the perspectives for future research?

### 1.1 Wine glass model

The plot and the flow of the story of IMRAD style writing are explained by a ‘wine glass model’.<sup>[1]</sup>

Writing, compliant with IMRAD format (IMRAD writing) typically first presents " (a) the subject that positions the study from the wide perspective", " (b)outline of the study", develops through "(c) study method", and "(d) the results" , and concludes with " (e) outline and conclusion of the fruit of each topics", and " (f) the meaning of the study from the wide and general point of view".<sup>[1]</sup> Here, (a) and (b) are mentioned in the section of the “Introduction”, (c) and (d) are mentioned in the section of the “Method” and “Result” respectively, and (e) and (f) are mentioned in the section of the “Discussion” or “Conclusion”.

In this sense, to explain how to line up the information in IMRAD writing, the ‘wine glass model’ (see the pattern diagram shown in Fig.1) will be helpful (see pp 2-3 of the Hilary Glasman-deal <sup>[1]</sup>). As mentioned in above-mentioned textbook,<sup>[1]</sup> the scheme of ‘wine glass model’ have two characteristic. First one is “top-bottom symmetric shape” and Second one is “changing width” i.e. “the top is wide and it narrows towards the middle, and then widens again as it goes down toward the bottom” .

The First one, “top-bottom symmetric shape”, represents the symmetry of the story development. Note the shape of the top trapezoid (representing the structure of Introduction) and the shape of the trapezoid at the bottom are reversed. This is expressing that the same subject introduced in Introduction will be taken up again in suitable formation for the section of Discussion/Conclusion in these section in the reversed order. (See the relationship between abovementioned (a),(b) and (e),(f).)

The Second one, “the change of the width” of the schema shown in Fig.1, represents the change of generality of the view point. As along the flow of the story development, when the viewpoints are more general, the width of the diagram is expressed wider, and when they are more specialized and focused, the width is expressed narrower.

## 1.2 As the standard format of academic journal.

The IMRAD format has been adopted by a steadily increasing number of academic journals since the first half of the 20th century. The IMRAD structure has come to dominate academic writing in the sciences, most notably in empirical biomedicine.<sup>[3][4][5]</sup> The structure of most public health journal articles reflects this trend. Although the IMRAD structure originates in the empirical sciences, it now also regularly appears in academic journals across a wide range of disciplines. Many scientific journals now not only prefer this structure but also use the IMRAD acronym as an instructional device in the instructions to their authors, recommending the use of the four terms as main headings. For example, it is explicitly recommended in the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" issued by the International Committee of Medical Journal Editors (previously called the *Vancouver guidelines*):

The text of observational and experimental articles is usually (but not necessarily) divided into the following sections: Introduction, Methods, Results, and Discussion. This so-called "IMRAD" structure is not an arbitrary publication format but rather a direct reflection of the process of scientific discovery. Long articles may need subheadings within some sections (especially Results and Discussion) to clarify their content. Other types of articles, such as case reports, reviews, and editorials, probably need to be formatted differently.<sup>[6]</sup>

The IMRAD structure is also recommended for empirical studies in the 6th edition of the publication manual of the American Psychological Association (APA style).<sup>[7]</sup> The APA publication manual is widely used by journals in the social, educational and behavioral sciences.<sup>[8]</sup>

## 2 Benefits

The IMRAD structure has proved successful because it facilitates literature review, allowing readers to navigate articles more quickly to locate material relevant to their purpose.<sup>[9]</sup> But the neat order of IMRAD rarely corresponds to the actual sequence of events or ideas of the research presented; the IMRAD structure effectively supports a reordering that eliminates unnecessary detail, and allows the reader to assess a well-ordered and noise-free presentation of the relevant and significant information. It allows the most relevant information to be presented clearly and logically to the readership, by summarizing the research process in an ideal sequence and without unnecessary detail.

## 3 Caveats

The idealised sequence of the IMRAD structure has on occasion been criticised for being too rigid and simplistic. In a radio talk in 1964 the Nobel laureate Peter Medawar even criticised this instructive text structure for not giving a realistic representation of the thought processes of the writing scientist: "... the scientific paper may be a fraud because it misrepresents the processes of thought that accompanied or gave rise to the work that is described in the paper".<sup>[10]</sup> Medawar's criticism was discussed at the XIXth General Assembly of the World Medical Association in 1965.<sup>[11][12]</sup> While respondents may argue that it is too much to ask from such a simple instructional device to carry the burden of representing the entire process of scientific discovery, Medawar's caveat expressed his belief that many students and faculty throughout academia treat the structure as a simple panacea. Medawar and others have given testimony both to the importance and to the limitations of the device.

## 4 Abstract considerations

In addition to the scientific article itself a brief abstract is usually required for publication. The abstract should, however, be composed to function as an autonomous text, even if some authors and readers may think of it as an almost integral part of the article. The increasing importance of well-formed autonomous abstracts may well be a consequence of the increasing use of searchable digital abstract archives, where a well-formed abstract will dramatically increase the probability for an article to be found by its optimal readership.<sup>[13]</sup> Consequently, there is a strong recent trend toward developing formal requirements for abstracts, most often structured on the IMRAD pattern, and often with strict additional specifications of topical content items that should be considered for inclusion in the abstract.<sup>[14]</sup> Such abstracts are often referred to as "structured abstracts".<sup>[15]</sup> The growing importance of abstracts in the era of computerized literature search and information overload has led some users to modify the IMRAD acronym to AIMRAD, in order to give due emphasis to the abstract.

## 5 Heading style variations

Usually, the IMRAD article sections use the IMRAD words as headings. A few variations can occur, as follows:

- Many journals have a convention of omitting the "Introduction" heading, based on the idea that the reader who begins reading an article does not need to be told that the beginning of the text is the introduction. This print-era proscription is fading

since the advent of the Web era, when having an explicit “Introduction” heading helps with navigation via document maps and collapsible/expandable TOC trees. (The same considerations are true regarding the presence or proscription of an explicit “Abstract” heading.)

- In some journals, the “Methods” heading may vary, being “Methods and materials”, “Materials and methods”, or similar phrases. Some journals mandate that exactly the same wording for this heading be used for all articles without exception; other journals reasonably accept whatever each submitted manuscript contains, as long as it is one of these sensible variants.
- The “Discussion” section may **subsume** any “Summary”, “Conclusion”, or “Conclusions” section, in which case there may or may not be any explicit “Summary”, “Conclusion”, or “Conclusions” **subheading**; or the “Summary”/“Conclusion”/“Conclusions” section may be a separate section, using an explicit heading on the same heading hierarchy level as the “Discussion” heading. Which of these variants to use as the default is a matter of each journal’s chosen style, as is the question of whether the default style must be forced onto every article or whether sensible inter-article flexibility will be allowed.

## 6 Other elements that are typical although not part of the **acrostic**

- Disclosure statements
  - Reader’s theme that is the point of this element’s existence: “Why should I (the reader) trust or believe what you (the author) say? Are you just making money off of saying it?”
  - Appear either in opening footnotes or a section of the article body
  - Subtypes of disclosure:
    - Disclosure of funding (grants to the project)
    - Disclosure of conflict of interest (grants to individuals, jobs/salaries, stock or stock options)
- Clinical relevance statements
  - Reader’s theme that is the point of this element’s existence: “Why should I (the reader) spend my time reading what you say? How is it relevant to my clinical practice? Basic research is nice, other people’s cases are nice, but my time is triaged, so make your case for ‘why bother’”

- Appear either as a display element (sidebar) or a section of the article body
- Format: short, a few sentences or bullet points

- Ethical compliance statements
  - Reader’s theme that is the point of this element’s existence: “Why should I believe that your study methods were ethical?”
  - “We complied with the **Declaration of Helsinki**.”
  - “We got our study design approved by our local **institutional review board** before proceeding.”
  - “We got our study design approved by our local ethics committee before proceeding.”
  - “We treated our animals in accordance with our local **Institutional Animal Care and Use Committee**.”

## 7 Additional standardization (reporting guidelines)

In the late 20th century and early 21st, the scientific communities found that the communicative value of journal articles was still much less than it could be if **best practices** were development, promoted, and enforced. Thus reporting guidelines (guidelines for how best to report information) arose. The general theme has been to create **templates** and **checklists** with the message to the user being, “your article is not complete until you have done all of these things.” In the 1970s, the ICMJE (International Committee of Medical Journal Editors) released the **Uniform Requirements for Manuscripts Submitted to Biomedical Journals** (Uniform Requirements or URM). Other such **standards**, mostly developed in the 1990s through 2010s, are listed below. Most researchers cannot be familiar with them all, but it is enough to know which ones must be followed in one’s own work, and to know where to look for details when needed.

## 8 References

- [1] Hilary Glasman-deal (2009). *Science Research Writing: A Guide for Non-Native Speakers of English*. Imperial College Press. ISBN 978-1848163102
- [2] George M. Hall (Editor); “How To Write a Paper, 5th Edition “December 2012, BMJ Books ISBN 978-0-470-67220-4
- [3] Luciana B. Sollaci & Mauricio G. Pereira (July 2004). “The introduction, methods, results, and discussion (IMRAD) structure: a fifty-year survey”. *J Med Libr Assoc* (J Med Libr Assoc. 2004 July; 92(3): 364–371) **92** (3): 364–7. PMC 442179. PMID 15243643.

- [4] Day, RA (1989). "The Origins of the Scientific Paper: The IMRAD Format" (PDF). *American Medical Writers Association Journal* 4 (2): 16–18. Retrieved 2011-06-17.
- [5] Szklo, Moyses (2006). "Quality of scientific articles". *Revista de Saúde Pública* 40: 30–35. doi:10.1590/s0034-89102006000400005. Retrieved 2011-06-17.
- [6] "Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication - IV.A.1.a. General Principles" (PDF). International Committee of Medical Journal Editors. Retrieved 2010-03-08.
- [7] American Psychological Association (2010). *Publication Manual of the American Psychological Association* (6th ed.). American Psychological Association. ISBN 978-1-4338-0562-2.
- [8] "The IMRAD Research Paper Format". Department of Translation Studies, University of Tampere. Retrieved 2008-10-22.
- [9] Burrough-Boenisch, J (1999). "International Reading Strategies for IMRD Articles". *Written Communication* 16 (3): 296–316. doi:10.1177/0741088399016003002. Retrieved 2011-06-17.
- [10] Medawar, P (1964). "Is the scientific paper fraudulent?". *The Saturday Review* (August 1): 42–43. Retrieved 2012-11-05.
- [11] Brain, L (1965). "Structure of the scientific paper" (PDF). *Br Med J* (2): 868–869. doi:10.1136/bmj.2.5466.868. Retrieved 2011-06-19.
- [12] Editorial (1965). "Report of Editors' Conference" (PDF). *Br Med J* (2): 870. doi:10.1136/bmj.2.5466.870. Retrieved 2011-06-19.
- [13] "Structured Abstract Initiative". Education Resources Information Center. Retrieved 2011-06-17.
- [14] Ripple, AM; Mork JG; Knecht LS; Humphreys BL (2011). "A retrospective cohort study of structured abstracts in MEDLINE, 1992-2006.". *J Med Libr Assoc*. 99 (2): 160–3. doi:10.3163/1536-5050.99.2.009. PMC 3066587. PMID 21464855.
- [15] U.S. National Library of Medicine (2011-06-16). "Structured Abstracts".

- case series
- meta-analyses

## 9 See also

- Eight-legged essay
- Schaffer paragraph
- Five paragraph essay
- IRAC
- literature review
- case report

## 10 Text and image sources, contributors, and licenses

### 10.1 Text

- **IMRAD** *Source:* <https://en.wikipedia.org/wiki/IMRAD?oldid=680994650> *Contributors:* SimonP, Hugh2414, Andycjp, Mr Bound, Dhartung, Rjwilmsi, Jivecat, Utuado, Ground Zero, Kkmurray, Crystallina, SmackBot, Pkg, Jrockley, BillRoller, Richard001, Yohan euan o4, Ynod, Jonbmfc, Cydebot, Alaibot, Headbomb, Raphaelmak, Guillaume2303, JL-Bot, ClueBot, The Thing That Should Not Be, Alexbot, Addbot, Fgnievinski, Kman543210, Quercus solaris, Ettrig, Ben Ben, Yobot, Avilena, Wallstonekraft, AnomieBOT, Sylwia Ufnalska, Eeepy14, Discoursetheory, John of Reading, Orphan Wiki, WikitanvirBot, Seren-dipper, Spicemix, ClueBot NG, Sstu005, Hercumer, Runareggen, Helpful Pixie Bot, Khflyum, BattyBot, Mogism, Tom Toyosaki, Laceyvd123, Monkbot and Anonymous: 33

### 10.2 Images

- **File:Wineglass\_model\_for\_IMRaD\_structure..png** *Source:* [https://upload.wikimedia.org/wikipedia/commons/7/75/Wineglass\\_model\\_for\\_IMRaD\\_structure..png](https://upload.wikimedia.org/wikipedia/commons/7/75/Wineglass_model_for_IMRaD_structure..png) *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Tom Toyosaki

### 10.3 Content license

- Creative Commons Attribution-Share Alike 3.0