



Review writing: An Insider's Insight

The ever-increasing range of scientific knowledge, coupled with the continued release of scientific publications, makes it difficult to stay up to date on the state of play in any field, therapeutic area or discipline. Keeping up with new research requires a considerable investment of time. This feeds the need for well-conceived review articles that summarise the state-of-play and, through the cited literature, provide an opportunity to dig deeper into the topic of interest.

Writing timely and relevant review articles is a complex process. The first step is to establish the scope of your article describing the topic, the purpose and the target audience. Ensure that you remain within this scope throughout the development process.

Before you start

- Ask yourself why it is important to review the topic
- Trace the intellectual progression of the field, including major debates
- Question how well the problem has been researched/reported to date and what specific aspect of the topic needs a fresh look

Prepare to succeed

- Aim to create an article that will add value to the field of study
- Clearly describe how you sourced, rated and selected the data you report
- Understand what conclusions you will be able to make from the review and what recommendations will you be able provide to the readership

Key Insights

Review articles are key components of the medical and scientific literature that are well-liked and sought after by both readers and journals. The perception is that they provide credible and reliable observations about a specific area to readers while attracting readership to journals. They serve as a summary and critical analyses of available information about a specific topic. Unlike the research articles they typically summarise, review articles tend not to present new data - their purpose is to put the current state of research into perspective for a less specialised audience who need to stay up with developments around their chosen fields.

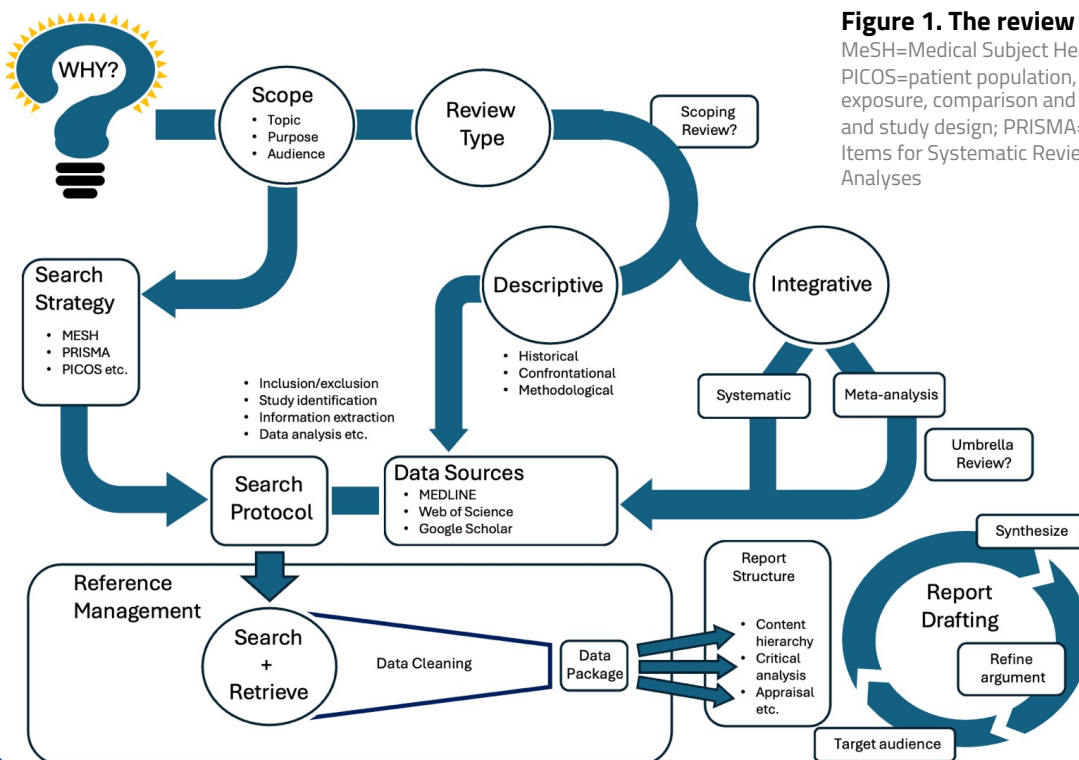
Many reviews tend to encompass large amounts of published data that may span decades, but often with a narrow focus. Identifying sources and critically evaluating the value of their contributions, in addition to synthesising a concise and accurate summary in an appropriate format takes a variety of skills [1]. Well-conceived review topics that target a specific audience are essential for delivering a high-quality literature review [2].

At least 64 million academic papers have been published since 1996, with the growth rate of newly published articles increasing over time. As of 2022, over 5.14 million academic articles are published per year, including short surveys, reviews, and conference proceedings [3].

Review articles are complex documents and during few last decades we have seen a departure from the traditional narrative and integrated review articles to more specialized review articles such as systematic reviews with or without meta-analyses, umbrella reviews, viewpoints, and scoping reviews (Figure 1). When prepared diligently, considering their different aspects, review articles can identify potential research areas to explore next, and sometimes they will draw new conclusions from the existing data.

Figure 1. The review writing process.

MeSH=Medical Subject Headings;
PICOS=patient population, interventions or exposure, comparison and outcome or endpoint and study design; PRISMA=Preferred Reporting Items for Systematic Reviews and Meta-Analyses



Scope/focus

The first step is to establish the scope of your article: the topic, the purpose and the target audience. Ensure that you remain within this scope throughout the development process.

The size of the literature to be reviewed is an important factor to consider when determining the focus. The narrower the topic the easier it will be to limit the number of source articles to work with [4]. In contrast, interdisciplinary reviews where the aim is to bridge the gap between fields can generate numbers of articles that quickly become difficult to manage [5]. Clearly defining the article's purpose helps limit source documents to only those that make valuable contributions. Objectives for review articles that are considered to add value generally:

- Provide an updated interpretation of old research or combine old and new understandings
- Map the intellectual progression of the field with key milestones
- Provide an evaluation of available sources, highlighting the most pertinent and/or relevant
- Share opinions on apparent conflicts derived from contradictory findings
- Identify gaps in our understanding and point the way to future research

Review Type

Review articles fall into one of two categories: descriptive or integrative. The most common type of reviews tend to be descriptive in nature and are generally termed narrative or scholarly reviews. These focus on the methodology, findings and/or interpretation of each of your cited sources. In contrast, integrative reviews attempt to find common ideas and concepts [6]. Deciding on which to use will likely depend on availability of the subject matter and the resources/time available to perform the analysis of the source materials [7].

Narrative reviews tend to be qualitative in nature and often used to establish where there may be existing deficiencies or limitations in understanding of established theories or relating to emerging research problems. They can often be vague in their purpose and eclectic in both the selection and interpretation of the information they review, introducing the potential for author bias. These reviews tend to follow one of three themes:

- **Historical:** follows the research and understanding of a field over time. They often start with the first time an issue, concept, theory or phenomena is reported. Articles follow the evolution of state-of-the-art developments and may identify likely directions for future research
- **Confrontational:** highlights research that refutes or supports an established argument, imbedded assumption or philosophical problem. When used to make summary claims they can be particularly susceptible to author bias
- **Methodological:** investigates how different research/technical approaches, available methodologies, data collection and/or analyses impact on interpretation. Authors often draw on a variety of different knowledge sources to describe how a field is developing

Integrative reviews are presented as either systematic reviews or meta-analyses. They are often incorporated in evidence-based medicine approaches to clinical problems that derive treatment guidelines. They use explicit and rigorous methods to identify, critically evaluate and synthesise data from any relevant studies. The aim is to present a concise summary of the best available evidence relating to clearly defined clinical questions [8, 9, 10], testing a hypothesis based on published evidence gathered by a predefined protocol devised [11, 12]. When systematic reviews analyse quantitative data from work addressing related or identical hypotheses that employ similar methodology, they become a meta-analysis. A well-performed integrative review meets the same standards as primary research with regards to its clarity, rigor and replication [13, 14].

Cochrane Database of Systematic Reviews

The Cochrane organisation is a global network of researchers, and their reviews are one of the most highly regarded sources of healthcare evidence. Cochrane databases contain systematic reviews carried out by groups; each group focuses on a specific healthcare topics. They develop systematic reviews of research in health care and health policy using explicit systematic methods [15–17]. The full text of all completed Cochrane Reviews are available in the Cochrane Library as are the protocols for reviews that are currently in progress.

Cochrane reviews include: Intervention reviews; Diagnostic test accuracy reviews; Prognosis reviews; Qualitative evidence syntheses; Methodology reviews; Overviews of reviews; Rapid reviews; Prototype reviews.

Scoping reviews

These are a relatively new approach to evidence synthesis and currently there is little guidance regarding the decision to choose between a systematic review or scoping review approach when synthesising evidence. They are generally conducted to determine the value and probable scope of a full systematic review. They may also be undertaken simply to summarize and disseminate research findings, to identify research gaps, and to make recommendations for the future research.

Umbrella reviews

These reviews comprise a systematic collection and assessment of multiple systematic reviews and meta-analyses on a specific research topic. They were originally developed to deal with the increasing number of systematic reviews and meta-analyses in biomedical literature. The validity of umbrella reviews depends on the coverage and quality of both the primary studies and the available systematic reviews and meta-analyses.

The Mini-Review

Certain journals favour the publication of shorter or mini reviews that focus on very specific topics covering a limited time frame and containing a set number of words, tables/figures and citations. These tend not to be comprehensive in their considerations, rather consider very specific questions of interest. Their abbreviated nature can attract more attention from busy readers than more detailed reports.

Data sources

Investigators identifying relevant source materials are generally advised to search multiple databases to adequately identify all literature related to the topic of interest [18–23]. The most appropriate databases to include in your search strategy is of particular importance for integrative reviews. The Cochrane Handbook, for example, recommends the use of at least MEDLINE and Cochrane Central and, when available, Embase for identifying reports of randomized controlled trials [15]. Several studies have investigated the added value of using multiple databases on search efficiency [16, 24–30]. Some concluded that using a single database is sufficient [31, 32]. Others have concluded that using one database alone fails to retrieve all references for systematic reviews [33,34].

Most articles on this topic draw their conclusions based on database coverage of the literature [29]. A recent paper considered the value of adding an extra database to your search strategy but no true conclusion could be drawn [35]. In reality, the inclusion of a single publication in a database does not necessarily translate into it being found by your search strategy.

Recent work looking to determine the optimal combination of databases needed for systematic review searches (i.e., minimising the burden for the investigators without reducing the validity of the research by missing relevant references) suggests that searches for integrative reviews should at least involve Embase, MEDLINE, Web of Science, and Google Scholar [36].

Using multiple databases introduces its own issues. It can be laborious for searchers to translate search strategies into multiple interfaces and search syntaxes, factors such as field codes and proximity operators differ between interfaces [37]. It can also increase the time needed for reviewers to screen additional outputs. Finally, access to certain databases is often limited and only available on subscription basis.

Searching and sorting

The process of collating your primary data sources follow the formal protocol, keeping a record of the search outputs at every step [7]. This is particularly important if you intend to employ a variety of alternative search strategies across multiple databases. These findings represent the raw search data that will be analysed or modify the search strategy.

It can be useful (though not essential) to use a reference management software to organise the search outputs. Even the simplest search strategies can end up generating considerable numbers of candidate articles to be filtered for relevance and duplication. Reference managers often include tools that merge search outputs from different databases/searches and can identify and remove duplicates. Some will allow you to refine your keyword strategy using your extracted data.

Your final core data will need to be reviewed by assessors, who will rate each candidate manuscript depending on whether they fulfil the required inclusion/exclusion criteria. This is best done in duplicate to confirm inclusion. A secondary review may also be performed on the references cited in the candidate manuscripts and cross-referenced against the existing list – this has been termed citation chaining [26]. Newly identified candidates should be entered into the filtering process to ensure they meet the inclusion criteria.

It is strongly recommended that you write a formal protocol describing the search strategy you plan to use to source your information irrespective of whether you plan to adopt a descriptive or integrative approach. You can use this to provide your reader with an understanding of the robustness of your approach when it comes to reporting the findings of any review. The scientific credibility of the review's findings will rely on the clarity with which you communicate your approach and the efforts you took to provide an unbiased, reproducible and objective report [37]. Beyond the database source, there are six key methodological considerations:

- **Inclusion-exclusion criteria:** identifying specific study populations/characteristics, designs or interventions, outcome measures, date range, language restrictions, required sample size and excluding predatory journals etc
- **Study identification:** search terms and keywords used and how they are combined, types of articles included (cross reference against citations discovered in review articles and bibliographies) and combining data from different databases
- **Selection:** eligibility criteria for work identified for inclusion, how articles were screened for relevance from primary data such as title/abstract, data reviewers used, criteria identifying candidate articles for full text review (that pass primary eligibility checks)
- **Information extraction:** data taken from each of the data sources. Share how any numerical data is collected for further analysis – was it extracted from table/graphs and did it have any associated distribution data (error estimates etc.)
- **Quality assessment:** reporting robustness of the data sources as described by the EQUATOR Network (www.equator-network.org)
- **Data analysis:** Any statistical techniques applied to extracted data. For example, were odds ratios calculated for each parameter when reviewing treatment outcomes with 95% confidence intervals and p-values for magnitude of effect or any other methods used to determine whether compared studies derived similar conclusions (or not)

Content hierarchy

Considering the general acceleration in scientific development, your review will need to offer more than an assessment of the direction of travel to stay relevant for any reasonable time. Including reports listed on pre-print servers may help with staying ahead of the game – appreciating that any such work has not been validated by peer review. Summarise and critique studies that warrant particular attention, giving credit to those studies that made important contributions and those that yielded the most significant findings. The overall 'value' placed on a piece of work included in your review should be based on factors such as:

- The key findings
- The provenance of the research team/publishing journal
- Any study limitations and/or shortfalls
- How appropriate the methods are and whether they provide data that can support your hypothesis
- Whether the interpretation of the results and the subsequent conclusions are supported
- The overall contribution of the work to the field and/or the present exercise

Reporting structure

It is possible when writing a narrative review about a subject you understand to construct your arguments based on your existing knowledge. When you are not writing about your own area of expertise it can be challenging to present the flow, draw the reader into the article and guide them through your considerations. You need to establish a clear reporting structure to facilitate the readers understanding.

The structure should include the following:

- A subject overview of the issue/theory and your objective
- A description of the division of the work being reviewed in terms of themes/category
- How each of the included study reports are similar, how they vary and which make the most significant contribution (patient/subject profile, disease status, methodological approach, different outcome measures studied, etc.)
- Quality scores relating to which studies had particularly poor-quality data and review whether any differences in opinion might be the result of different methodological approaches, study population, etc
- Search methods used, attrition rates during filtering (duplicates, exclusions) including the results of abstracts/title screening and the number of full manuscripts that were assessed and, of these how many were excluded from the final number of manuscripts included in the review
- A clear and rational conclusion and possible recommendations

Writing

No doubt you will have made copious notes capturing your thoughts and insights on how to best organise your review and what to write when summarising the source documents. These notes will most likely form the outline of your first draft – but this will face considerable rewriting, restructuring and redrafting when finalising your article [38]. A well-written review article is like any other good piece of writing, it tells a great story and sets important questions, which it attempts to address. Your work should demonstrate a critical grasp of relevant works, underline and discuss the most significant ideas and findings in earlier works and illustrate a selection of key research in the field.

Authors should note that their audience will be unduly influenced by the Introduction and will decide whether to read further on the basis of the first few sentences (if they haven't already been repelled by the title [39]). Readers are also influenced by how you start each of your sections, deciding whether to read, skim or skip the rest of the section depending on what they find. Make it good.

Introduction, Methods, Results and Discussion

Although there is no fixed requirement when structuring a review article, for integrative reviews, there is value in considering the IMRAD structure for some cases. In addition to providing a means of introducing the field of study and methods, a results section can describe the findings of the literature search in a logical and structured fashion.

Use Evidence: A literature review is just like any other academic research paper. Your interpretation of the available sources must be backed up with evidence

Be Selective: Only report the most important points. The type of information you choose to mention should relate directly to the research problem, whether it is thematic, methodological, or chronological

Summarize and Synthesize: Reproduce important features of your source information, but then synthesize it by establishing the study's significance and relating it to other work

Use Your Own Voice: The author's voice should remain front and centre. For example, weave the source data from cited references into what you are writing but maintain your own voice by starting and ending the paragraph with your own ideas and wording

Added value

Many narrative review articles do little more than provide an annotated version of a bibliographic database search. A good literature review should aim to analyse, critique and assess the existing literature and, by identifying threads and themes in the reported research findings, take the opportunity to illustrate how you have addressed gaps in the field [40]. Your audience should take away an understanding of:

- Major achievements in the reviewed field.
- The main areas of debate.
- Unresolved research questions.

When summarising your assessment, it is important to describe the limitations of the studies included and the reliability of the results. For example, were non-English publications omitted? Does the review only include a handful of papers with a small sample size? When putting your work in context you need to discuss:

- How robust are the results?
- Were there any biases?
- The strengths and weaknesses of the review methods.

The relevance of your work will depend on how well you compare your thoughts with earlier reviews, current opinions and guidelines. Finally, the most valuable reviews provide conclusions and their implications for current practice and future research. This is especially important when addressing highly technical, advanced or obscure subjects. Sometimes, authors need to make compromises, particularly when attempting to summarize a difficult subject to the satisfaction of both expert and amateur.

“My congratulations to you, sir. Your manuscript is both good and original; but the part that is good is not original, and the part that is original is not good.”

— Samuel Johnson

An Interview With Our Managing Director

Q What do you look for in a good review article?

A Even though a review article is not a research article, the same important concepts that help you create a good research paper still apply. The title should clearly describe the topic and highlight what aspect of the topic is being covered. Abstract requirements for content and format differ, depending on the type of review and journal, but it should stand on its own and include, at a minimum, the topic or question and the need for a review, what is included and its conclusions.

"In old days books were written by men of letters and read by the public. Nowadays books are written by the public and read by nobody."

— Oscar Wilde

Q What is the first thing you consider when planning to write a review article?

A My first thought is how am I going to keep the number of source articles to a minimum. The art is in defining a robust search and filtering strategy that leaves me with only the most 'appropriate' articles. In many cases this involves an iterative process of discovery, testing a variety of search strategies. The key to getting the most out of your searches is in keeping comprehensive records from the very first tests onwards. Stay open to including obscure articles but don't get distracted into attempting to 'boil the oceans dry' searching for holy grail articles that may not exist.

Q Why are systematic reviews so important?

A Most modern medicine approaches are evidence-based in that they aim to combine the best available scientific evidence with clinical experience and individual judgment of patient needs. In the hierarchy of scientific evidence, systematic reviews (along with meta-analyses) occupy the highest levels in terms of the quality of evidence. A systematic review is the process of searching, selecting, appraising, synthesising and reporting clinical evidence on a particular question or topic. It is currently considered the best, least biased and most rational way to organise, gather, evaluate and integrate scientific evidence from the rapidly-changing medical and healthcare literature.

As review articles target wider audiences, the style of writing should be more general than primary manuscripts. Use of specialised abbreviations and jargon should be avoided and/or carefully introduced.

Artificial intelligence

Recently artificial intelligence (AI) models have been incorporated into tools that can augment your search strategies. In its simplest form, large language models can be used to generate alternate search terms to use in traditional lexical search strategies. More interesting are the potential benefits that may be derived beyond keyword-based searches. Termed semantic searching, large language models can be used to interpret the meaning of words and phrases used to search for information. These tools can provide maps of data sources, review the citations of papers of interest and narrow lists by the application of filters. In some cases, they may be searching more than the titles and abstracts you would use to assess a manuscripts suitability.

One example is Sysrev, a machine learning-powered platform for document review and data extraction with the ability to directly integrate with alternate data sources and databases. The tool was built to aid in the creation of system evidence reviews. It has already been used to create over 16,000 reviews. It uses FAIR principles: Findability, Accessibility, Interoperability and Reuse of digital assets [41]. Its creation is a consequence of the recognised need to reduce redundancy and the inefficient use of human time and increase the impact of evidence-based decision-making.

However, these tools have their limitations. At best, they only search the same data sets as you yourself would search (possibly searching less data if the data is locked behind paywalls). Consequently, they do not appear to result in significantly greater numbers of candidate manuscripts [42]. They can also generate results that are out of context and/or inaccurate due to a phenomenon called hallucination [43–47].

And finally...

As our knowledge expands it becomes ever more difficult to stay up to date on the state of play in any specific field, therapeutic area or discipline [48]. It requires a considerable investment of time to keep up with the publication of new research. There is an ever-expanding need for well-conceived reviews [49], though it is generally accepted that they can be subject to issues if they are not compiled methodically and responsibly [50].

Common errors and oversights to avoid when writing a literature review include:

- A failure to establish a clear hypothesis, purpose or research question
- An unclear review methodology
- Missing important studies due to an inadequate literature search
- Reliance on secondary analytical sources rather than including relevant primary research reports
- A failure to critically examine all aspects of the research design and analysis, which results in source findings and interpretations being too readily accepted as valid
- Introducing bias by only including research that validates assumptions and does not consider contrary findings and alternative interpretations
- No clear conclusion or statement to summarise the findings of the review.

Next Steps

When done correctly, literature reviews are invaluable for providing insights into research and developing evidence-based guidelines and recommendations. We created this Insider's Insight into writing reviews to share some helpful pointers from what we have learned providing reviews over the last 25+ years. We hope you found it useful.

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