How to Write a Review Article?

Dr. Surendra Bahadur Mathur [1], Dr. Devendra Mishra[2]

From:1. Assistant Professor, Department of Pediatrics, Maulana Azad Medical College & Associated Hospitals, Bahadur Shah Zafar Marg, New Delhi – 110002, India 2. Director Professor, Department of Pediatrics, Maulana Azad Medical College & Associated Hospitals, Bahadur Shah Zafar Marg, New Delhi – 110002, India

Correspondence: Dr. Surendra Bahadur Mathur
Email: sbmathur05@gmail.com, Mobile: +91 9639960466

The generation of evidence is an ongoing process in the field of medicine. Basic and clinical research have been the pillars of modern medicine and continue to be the strength of a modern medical practitioner. With increasing number of biomedical journals and therefore research articles being published, staying updated with the current evidence is a necessity for the clinician.

One of the five goals of an Indian medical graduate as prescribed by the National Medical Commission is to function as a lifelong learner committed to continuous improvement of skill and knowledge [1]. It would be ideal that any topic of concern is thoroughly searched, read, reviewed and analyzed by going through all the literature. However, this is easier said than done. This task is nothing less than swimming in the middle of an ocean with no land in sight.The variability in the quality and content of the enormous amount of information available confuses the clinician who ends up having more unanswered questions than before. It is for such situations that a state of the art, reliable, well written review article acts like a lifeboat.

A review article is a comprehensive synthesis of published and unpublished material on a topic. It is a well planned and well-organized analysis of all the literature relevant to a topic of interest providing a useful summary and answers to the reader's doubts and questions. It facilitates the medical practitioner to take evidence based clinical judgements and decisions. It is a practical solution to the problems of excessive information, divergent views and lack of consensus on a topic. Review articles aid decision making in clinical practice by summarizing enormous information available, in a coherent and easily understandable form, thereby acting as guides for practicing evidence-based medicine. They facilitate in understanding of recent advances, complex topics and sub topics, which are not a part of the conventional textbooks. They help in the identification of relations, contradictions, controversies and lacunae in the existing literature, and provide a direction for future research.

Types of Review Article

Review articles are classified as Narrative Reviews (NR) and Systematic Reviews (SR). NR are a summary of the evidence obtained from the studies selected and analyzed according to the author's selective literature search and review of literature. They are written in a format which is easy to read and understand. They provide a critical assessment of a wide range of issues on the topic of interest.They are useful even to those readers who may have no or limited knowledge of statistics or research methodology. They provide a comprehensive information about a clinical topic or a decision-making algorithm and are sought after by young clinicians or students for a broad and quick understanding of the topic of interest.

Indian Journal of Developmental & Behavioral Pediatrics
(Official Journal of IAP Chapter of Neurodevelopmental Pediatrics)

GUIDELINE

The main weakness of NR has been attributed to the fact that they are more prone to subjectivity in study selection and therefore may be biased. The search by the authors may be limited to freely available full text literature in open databases. NR do not necessarily state or follow strict criteria for search of evidence and arrival at conclusions. The selection bias may be compounded by a synthesis bias whereby the conclusions may be biased towards the personal opinions of the authors.

On the other hand, the broad principle of a systematic review is to apply scientific strategies that limit bias to the systematic assembly, critical appraisal and synthesis of all relevant research studies on a specific topic [2]. SRs formulate a well-defined question, provide a qualitative and quantitative analysis of all the relevant evidence and then may or may not be followed by a Meta-Analysis (MA). MA refers to the statistical analysis of the data from independent primary studies focused on the same question, which aims to generate a quantitative estimate of the studied phenomenon. Because of the fact that special emphasis is put in the methodology of SR to diminish biases, they are considered to be at the top of the pyramid of hierarchy of evidence [3]. SRs synthesize all the available relevant literature to result in an objective, reproducible and transparent conclusion. The research question, search criteria, study inclusion, data extraction, data synthesis and assessment of quality of study are pre-defined and protocol based in a SR.

SR are; however, not free from limitations. The narrow focus of SR does not allow for a comprehensive coverage of the topic of interest. Heterogeneity in the selected studies, biases pertaining to patient selection, evaluation and measurement in individual studies, and publication bias also hamper the quality of SR. Also, the rigorous methodology of SR is labor and time intensive. A comparison of NR and SR is shown in Table 1.

Steps of Writing a Review Article

Writing review articles is a good way for a new researcher to enter into scientific writing. Review of contemporary topics which provoke discussion regarding practice guidelines are sought after by all readers. However, it is always advisable that before conducting a NR, the authors must consult and send a proposal to the editor of the intended journal, as similar review articles may already be in submission or the topic may not fall in the scope of the journal. Similarly, registries for SR must also be checked for ongoing reviews in order to avoid redundancy. The following is a general overview of the steps of writing a review. This can easily be remembered by the simple mnemonic **REVIEW** - **R**esearch Question/ Topic of interest selection, **E**vidence search, **V**alue assessment, **I**ntegration and synthesis of descriptive data, **E**xamining quantitative data and **W**riting the review. This is summarized in Table 2.

Step 1: Research Question / Topic of Interest Selection

Framing and addressing the research question is the cornerstone of a good review. This step must be given ample amount of time. The research question must be clear, specific and relevant. The research question for a SR must have the essential 6 elements addressing the **PICOTS** questions i.e., **P**opulation/ **P**atient/ **P**roblem addressed, **I**ntervention or Exposure being evaluated, **C**omparator for the said intervention, **O**utcomes being assessed, **T**ime frame and **S**tudy design. The topic of interest for NR must preferably address patient-oriented outcomes of emerging or common illnesses, interventions or drugs which concern many readers [4]. They may also be written on new drugs, vaccines, diagnostic tests or guidelines for specific conditions. Broad, non-specific, theoretical, rare and unusual topics must be avoided for review articles, more so for a narrative review.

Step 2: Evidence Search

A comprehensive search for all the possible published and unpublished evidence, which can address the research question, is extremely important. The search must be Systematic, Objective, Reproducible and Transparent

Indian Journal of Developmental & Behavioral Pediatrics
(Official Journal of IAP Chapter of Neurodevelopmental Pediatrics)

GUIDELINE

(SORT). Based on the PICOTS components of the research question, searchable concepts must be identified. An exhaustive literature search can be started by using bibliographic databases which contain journal and newspaper articles, conference proceedings and papers, reports, government and legal publications, patents and books. Popular global online databases which provide free or subscription-based access include PubMed, Embase, Web of Science, Scopus, CENTRAL and Google Scholar. In order to retrieve the maximum number of relevant studies and diminish publication bias, the search strategy must employ other methods like 'hand searching' or going through grey literature, textbooks, references and citations or personally communicating with authors of unpublished work and subject experts for brainstorming and further guidance. Suitable search words like controlled vocabulary in conjunction with Boolean operators, truncations, limits and filters must be used to yield best search results. The search time frame, databases searched and the search strategy including search terms used must be mentioned in the methodology section of the review article in order to aid transparency and reproducibility.

The studies found by the search should be screened for eligibility for inclusion in the review. This includes a preliminary screening of the study titles followed by screening of the abstracts. The full text articles of the short-listed abstracts should then be assessed for eligibility based on the PICOTS components of the research question. A data extraction form must then be used to extract data of the eligible articles (after removing duplicates). The common headings of the data extraction form include (i) study information, including geographic location, survey years, research design, sample size, percentage of respondents among eligible participants, and number of institutions included; (ii) characteristics of participants, including mean age, gender, specialties; and (iii) outcomes.

Step 3: Value Assessment

Assessment of the value or quality of every included study is an indispensable component of the review process. It is important to discriminate good quality and poor-quality studies in order to derive correct conclusions based on higher weightage for the results of good quality studies. It may be essential to limit the review to studies which are most appropriately designed to address the topic of interest. The research methodology of individual included studies should be critically appraised to assess for the efforts made by the authors to minimize bias while conducting the study. Attempts must be made to identify poor quality studies having inappropriate study designs or inappropriate study methods.

Several standard tools are available online to assess the quality of studies included in SR. A commonly used tool for assessing the quality of RCTs is The Cochrane Risk of Bias tool [5]. This includes appraising the adequacy of the methodology of the study for random sequence generation, concealment of allocation, blinding of study participants, blinding of outcome assessors, incomplete outcome reporting, and selective outcome reporting. There is also an additional element for appraising any other bias. The Newcastle Ottawa Scale (NOS), Risk of Bias in Non-Randomized Studies of Interventions (ROBINS-I) tool and the QUADAS-2 tool are other tools for assessing quality of different types of studies [6-8].

Step 4: Integration & Synthesis of Descriptive Data

The descriptive characteristics of the included studies must be integrated and synthesized as it is rare for all researches to arrive at the same conclusion. This is one of the most difficult steps in which the researcher will need to apply their skills of critical reading and analysis to arrive at a rational, logical, evidence based, and comprehensive synthesis of the selected academic material. This step may be considered as the soul of review writing. The evidence can be categorized and analyzed holistically, as well as individually according to the key concepts or dimensions under evaluation.A comprehensive

Indian Journal of Developmental & Behavioral Pediatrics
(Official Journal of IAP Chapter of Neurodevelopmental Pediatrics)

GUIDELINE

table may aid in better understanding of the readers. By the end of this process the researcher would be able to identify the state of existing knowledge and also the lacunae pertaining to the topic of interest.

Step 5: Examining Quantitative Data

This step is usually performed in a SR in order to obtain pooled outcome measures. Quantitative data for each outcome measure are extracted from individual studies. The statistical procedure for pooling data from individual studies is called meta-analysis.Specialized software like the Cochrane Review Manager or RevMan may be used for conducting meta-analysis [9]. It presents the estimate of effect from each included study, relative weightage of each study and the pooled estimate of effect. The relative weight of a study is determined by the expected variance in the result. This is dependent on the sample size and width of the confidence interval of the effect. Pooled estimate of effect is not a mathematical average of the data from individual studies, but a weighted average.

The meta-analysis is graphically represented as a Forest plot. The parts of this graph can be better understood by taking an example of the Forest plot published in a study by Yeung, et al in 2021 [10]. This is given in Figure 1 mentioned. The interventions being compared and the outcome being analysed are mentioned as the title of the figure. In this example, the interventions being compared are systemic and inhaled steroids versus control. The outcome measure is the risk ratio or relative risk for in-hospital mortality. The table shows, the outcome data, effect with confidence interval and relative weight in pooled analysis, of each study arranged in rows chronologically. This is represented in the pictorial presentation by a square at a position representing the effect and of a size representing the weight. A horizontal line through the square represents the confidence interval. In this example, the first row shows that Yeh et al did a study in 1977 which had 35 participants for this outcome. Seventeen received

steroids and 18 received control intervention. This study contributed 10.4% weightage in pooled analysis. The risk ratio of in-hospital mortality was 0.53 with confidence interval 0.05 to 5.32 suggesting that steroids could be superior or inferior to control. The pictorial representation shows the low relative weight of the study and wide confidence interval crossing the vertical line of no effect (RR of 1.0). The pooled effect or the weighted average estimate of effect is represented in the row labelled as Total and is shown as the diamond in the pictorial presentation. The centre of the diamond represents the pooled effect and its width represents the confidence interval. In this example, the pooled effect suggests that the risk of in-hospital mortality may be 41% lesser with steroids compared to control. The true value may; however, vary between 72% lesser to 23% higher. The position and width of the diamond represent this pictorially and the fact that the diamond crosses the line of no effect suggest that the effect of the steroids could be superior or inferior to control.

The heterogeneity among studies is the variation in the effect of the studies which may occur due to random chance or other factors. To statistically assess the heterogeneity among studies, the I square (I^2) test is used. Heterogeneity is mentioned in the Forest plot. An I^2 of <50%, 50 – 75% and >75% is considered as low, moderate and high degree of heterogeneity. A *P* value of <0.10 suggests a statistically significant degree of heterogeneity. In this example, the heterogeneity is of low degree ($I^2 = 0\%$) and is not statistically significant ($p = 0.16$). The statistical model used for the meta-analysis may be random effect (RE) or fixed effect (FE). The RE model assumes that a distribution of true effects which vary from study to study exists. There is no single common effect. The FE model in contrast assumes that all studies aim to estimate a single common estimate of effect. The model used is mentioned in the column heading of the outcome measure and the pictorial representation. In this example, the random effect model is used for analysis.

Indian Journal of Developmental & Behavioral Pediatrics
(Official Journal of IAP Chapter of Neurodevelopmental Pediatrics)

GUIDELINE

Step 6: Writing the Review

This is the final stage of writing the review article in which the synthesis is lucidly presented to the reader in an easily understandable written format. NR should be written in a logical and sequential manner with a proper flow of ideas. The author should be prepared for multiple cycles of writing drafts, reflection after self or peer review, and refinement. It is important to have a structured presentation having sections and subsections without irrelevant repetition or flowery prose that will divert attention from the main focus of the review. Flowcharts, tables and boxes may be used to highlight important points in the review. It is also equally important not to indulge in publication misconduct. The temptation to blindly copy and paste should be strictly curbed and the content should be written in the researcher's own words with due acknowledgement and documentation of all references. SR must be presented in the general format of Introduction, Methodology, Results and Conclusions. The Preferred Reporting Items for Systematic reviews and Meta Analysis (PRISMA) statement may be followed for writing a SR [11].

Table 1: Comparison of Narrative Reviews and Systematic Reviews

| Characteristic	Narrative Review	Systematic Review
Scope	Usually broad scope.	Generally specific.
Research Question/ Hypothesis	To provide an overview of the topic of interest. May not be stated.	Clearly defined or well formulated research question.
Search Eligibility and Strategy	May not be predefined or according to some protocol. Involve subjective selection bias of the authors as the included studies are as per author's intuition and clinical experience.	Predefined and protocol based. Systematic, Objective, Reproducible and Transparent. Intention is that no study that can potentially answer the research question gets missed.
Appraisal of Studies	Qualitative appraisal of the included studies. May be influenced by the personal views of the authors. The methodology of the included studies may not be critically appraised.	Critical qualitative and quantitative appraisal of the included studies to estimate the risk of bias. A potential impact of such bias on the result of the systematic review and meta-analysis is also assessed.
Data Synthesis and Analysis	Simple description of study findings, mainly focusing on studies that the authors selected.	Protocol based qualitative and quantitative methods. Meta-analysis to obtain a pooled estimate of the included data may also be performed.

Indian Journal of Developmental & Behavioral Pediatrics
(Official Journal of IAP Chapter of Neurodevelopmental Pediatrics)

GUIDELINE

Interpretation	May be biased by author's opinion	Based on the data included.
Advantage	More popular among students, young researchers and practicing physicians. Does not require an in-depth knowledge of statistics or research methodology to write or understand. Offers solutions to problems and controversies based on the perspective and expertise of the author.	Detailed and rigorous methodology. Lesser chance of bias. Reproducible.
Disadvantages	Not very rigorous methodology. Prone to bias. Not reproducible.	Scope is limited by the defined research question/ hypothesis, search strategy and eligibility. Labor intensive. Time intensive. Require knowledge of statistical methods and research methodology to conduct and understand.

Table 2: Steps of Writing a Review Article

Step	Brief Description
Research Question/ Topic of interest selection	Clear, specific & relevant research question Should preferably address the PICOTS questions
Evidence search	Comprehensive, Systematic, Objective, Reproducible & Transparent search Should include multiple bibliographic databases Attempts should be made to incorporate all possible studies addressing the topic of interest
Value assessment	Methodology of individual included studies should be critically appraised to assess for possible bias Risk of bias for each study must be assessed
Integration and synthesis of descriptive data	Integration of all aspects of the topic of interest into a rational, logical, evidence based and comprehensive synthesis

Indian Journal of Developmental & Behavioral Pediatrics
(Official Journal of IAP Chapter of Neurodevelopmental Pediatrics)

GUIDELINE

Examining quantitative data	Meta-analysis to obtained pooled estimate of effect Depiction of the meta-analysis in the form of a Forest plot
Writing the review	Structured and reader friendly presentation of the synthesis PRISMA guidelines must be followed for SR

Figure 1: An example of a Forest Plot (Source: Yeung T, et al. Indian Pediatrics, 2021)
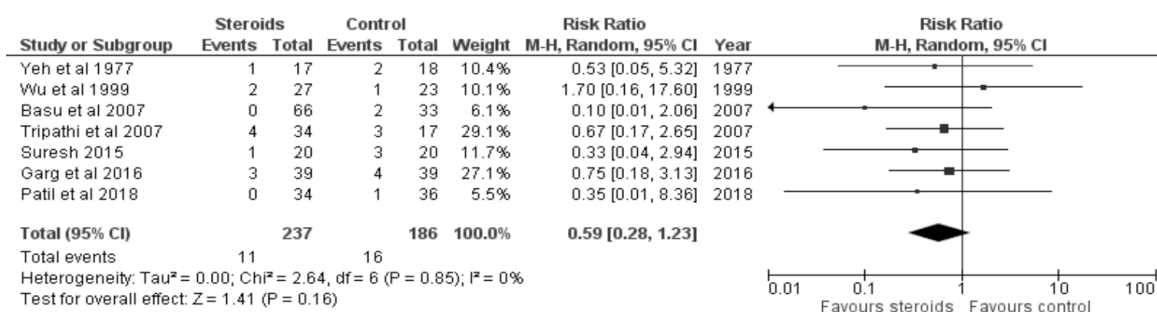
Supplementary Fig. 1 Comparison of in-hospital mortality in infants with meconium aspiration syndrome receiving systemic and inhaled steroids versus control.

Conclusion

Relevant review articles which are methodologically robust, comprehensive and well written are greatly appreciated by readers. SR are preferred for focused topics whereas, NR are better suited to comprehensive topics. Incorporation of a robust methodology similar to that essential for SR would strengthen the quality of NR. Similarly, SR would improve by incorporating the reader friendly style of presentation of NR. Young researchers as well as practicing clinicians would benefit by following the Steps of writing a review article which can easily be remembered by the simple mnemonic **REVIEW** - **R**esearch Question/ Topic of interest selection, **E**vidence search, **V**alue assessment, **I**ntegration and synthesis of descriptive data, **E**xamining quantitative data and **W**riting the review.

References

1. Medical Council of India. Competency Based Undergraduate Curriculum for the Indian Medical Graduate. 2018. [Last accessed on 2022 Aug 15]. pp. 17. Available from:https://www.nmc.org.in/information-desk/for-colleges/ug-curriculum/
2. Mathew JL. Systematic reviews and meta-analysis: A guide for beginners. Indian Pediatr. 2022;59:320-30.
3. Greenhalgh T. How to read a paper. Getting your bearings (deciding what the paper is about). BMJ. 1997;315(7102): 243-6.
4. Agarwal N, Dewan P. Writing a review article: Making sense of the jumble. Indian Pediatr. 2016;53:715-20.
5. Sterne JAC, Savovic J, Page MJ, et al. RoB 2: A revised tool for assessing risk of bias in randomised trials. BMJ. 2019;366:I4898.

Indian Journal of Developmental & Behavioral Pediatrics
(Official Journal of IAP Chapter of Neurodevelopmental Pediatrics)

GUIDELINE

6. Wells GA, Shea B, O'Connell D, et al. The Newcastle-Ottawa Scale (NOS) for assessing the quality of non-randomised studies in meta-analyses. [Last accessed on 2022 Aug 16]. Available from: https://www.ohri.ca/programs/clinical_epidemiology/oxford.asp

7. Sterne JA, Hernan MA, Reeves BC, et al. ROBINS-I: A tool for assessing risk of bias in non-randomised studies of interventions BMJ. 2016;355:i4919.

8. Whiting PF, Rutjes AWS, Westwood ME, et al. QUADAS-2: A Revised Tool for the Quality Assessment of Diagnostic Accuracy Studies. Ann Intern Med. 2011;155(8):529-36.

9. Cochrane Training. RevMan 5. [Last accessed on 2022 Aug 14]. Available from: https://training.cochrane.org/online-learning/ core-software/revman/revman-5-download.

10. Yeung T, Jasani B, Shah PS. Steroids for the management of neonates with meconium aspiration syndrome: A systematic review and meta-analysis. Indian Pediatr. 2021;58:370-6.

11. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71.