



Methodology of systematic reviews

Metodologija priprave sistematičnih preglednih člankov

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Abstract

Systematic reviews are a type of literature reviews that use systematic methods to collect data, critically appraise research studies and synthesize evidence (quantitative approach) and findings (qualitative approach). A systematic review provides a complete, exhaustive summary of current literature to a research question. Conducting a systematic review involves several steps and leads to a research question; this is followed by the implementation of a search strategy, data collection and quality assessment methods. The results may be aggregated, analysed and interpreted. The typical method in quantitative systematic review is statistical meta-analysis, while in qualitative systematic analysis the interpretative method is meta-synthesis. The main findings from the review are summarised. The limitations of the study and the reliability of the results are presented. Finally, the strengths and weaknesses of the review are discussed.

Izveček

Sistematični pregledni članki so tip pregleda literature, ki uporabljajo sistematične metode za zbiranje podatkov, kritično presojo in sintezo dokazov (kvantitativni pristop) oz. interpretacijo ugotovitev (kvalitativni pristop). Sistematični pregledni članki zagotavljajo celoten in izčrpen povzetek tekoče literature, ki predstavlja odgovor na raziskovalno vprašanje. Priprava sistematičnih preglednih člankov poteka v več stopnjah. Uvod v raziskave se začne z raziskovalnim vprašanjem, sledijo priprava in izvedba iskalne strategije, uporaba metod za zbiranje podatkov in kritična presoja. Uporaba metod je odvisna od tipa sistematičnega preglednega članka. V kvantitativnih sistematičnih preglednih člankih je tipična metoda metaanaliza, v kvalitativnih pa metasinteza. Sledijo standardni postopki, kot so analiza ter povzemanje dokazov, interpretacija ugotovitev in prispevek k znanju ter prikaz omejitev študij in veljavnost rezultatov. Razpravljamo tudi o prednostih in slabostih pregleda ter o posledicah za klinično prakso in zdravstveno politiko.

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1 Introduction

The role of research culture and related publication activities is growing in importance in science. Over the last few decades several significant changes have taken place in this field. Research is becoming increasingly more demanding, and has also garnered more support in organization and financing. The US agency responsible for research in biomedicine and public health, the National Institutes of Health, has been supporting research and publishing organizations since the 1990s with growing financial input, and has assumed responsibility for numerous new discoveries that have improved health on a global scale (1). Support for research worldwide has also resulted in a growing number of expert and scientific papers, which are now more readily accessible because of the internet. Naturally, many publications also result in opposing findings in research focused on similar scientific issues. Due to the multitude of articles on similar topics, literature reviews that combine, synthesize and assess research findings have become increasingly important. Literature reviews present a major challenge, as studies focusing on thematically similar research may employ highly divergent methodologies.

The quality of the review depends on the defined level. The highest level of review articles are systematic reviews, utilizing complex and multidisciplinary approaches that develop, comment on and connect evidence, interpret findings, contribute towards conceptual knowledge, confirm established theories and create new ones. Systematic reviews are of great importance for the development of clinical knowledge. They are also used as the highest level of proof in introducing new medical procedures at the Health Insurance Institute of Slovenia. Such reviews are key methods for bridging the gap between research and clinical practice. On the other end of the spectrum are increasingly popular systematic theoretical reviews that support the field of methodological theoretical development and 'opening up' reviewers' thinking about the research topic and widening the potential space of hypothesis generation (2).

Leading the preparation and production of high-quality systematic reviews is a demanding task, requiring not only exhaustive knowledge of a narrow expert area, but also the skills for preparing such reviews. Systematic reviews are secondary sources that analyze and synthesize empiric research from primary sources.

This article will focus on the planning, execution, organization and presentation of the results of systematic

reviews. We will introduce the tools and established guidelines for preparing systematic reviews. We will discuss the fundamental standards and principles that the authors must follow when preparing reviews, and detail the standardized structure of systematic review articles.

Systematic reviews have become very popular, with numerous initiatives collecting and organizing systematic reviews and other types of syntheses. Because systematic reviews are highly diverse, we will discuss various aspects in this article.

2 Literature reviews versus systematic reviews

Scientific journals publish several types of review articles, each with their own role and purpose. The basic types of reviews are literature reviews and systematic reviews. Literature reviews do not introduce new data, tests or unpublished materials, as they focus on analyzing existing research on a specific topic. Such reviews provide high-quality summaries of evidence on a particular issue arising from research already conducted by scientists and researchers. They utilize methods for extracting and interpreting studies and include a selective discussion of the literature on a certain research topic (3). Due to their long tradition, different approaches have become established. The most popular is critical presentation of the topic that encourages researchers to consider the concepts and theories. Another approach is uncovering the issues, weaknesses, discrepancies and controversies in a select field of research. The least frequent approach reviews the chronological development of theories and research on a specific topic that usually also comments on any shortcomings of the papers from a select field (4).

Review papers that rank highest in terms of quality on the hierarchy of evidence are systematic reviews, as they play an important role in evidence-based medicine and understanding medical phenomena. Systematic reviews form the research question clearly and employ the systematic and explicit method for identifying, selecting and critically evaluating published research, and for extracting and analyzing the data from the included studies. Whilst systematic reviews form the research question before beginning the review, in literature reviews the question is generally posed later. Finding literature for systematic reviews is a highly standardized procedure, which also separates it from general literature

reviews. Authors of both literature reviews and systematic reviews collect the content they require; however, in systematic reviews they also complement it with new evidence and findings, as well as develop new theories (5). Approaches to literature reviews are not clearly defined, while systematic reviews employ structured, methodological approaches, and result analyses are defined ahead of the research (6).

In biomedicine, systematic reviews have been established since the 1970s. After 20 years of laying the groundwork, support institutes such as Cochrane (previously known as The Cochrane Collaboration), Centre for Reviews and Dissemination, York, and Joanna Briggs Institute were founded, all tasked to popularise systematic reviews, support their preparation and encourage their impact on clinical practice and healthcare policies. Increasingly popular types of reviews are variants of systematic reviews that follow the same scoping procedure of systematic reviews, but are performed for different reasons and include some distinctive methodological differences (7). Systematic reviews usually provide an answer to a focused question with narrow parameters. When researching a diverse and complex field, we employ systematic scoping reviews. We use them to extract articles from the select field and establish the gap in the knowledge. Similar types of articles are so-called mapping reviews, except that they are not focused on a topic, but instead on a research question. In such reviews literature is presented visually, utilizing charts and diagrams. Mapping reviews provide information on the scope of publications that a certain topic has received in selected journals, etc. Similar to these are state-of-the-art reviews, which provide potential opportunities for research and ensure a critical approach, the synthesis of the current state of the field, and can provide conclusions in the form of new perspective or point to gaps in research (8).

3 What makes a systematic review?

In a systematic review the authors focus on a clearly defined research question and employ systematic and explicit methodology to identify, collect and critically assess all appropriate studies, and for data extraction and analysis with the final synthesis (9,10,11). Systematic reviews utilize transparent methods to summarize existing research that may differ in their design, the characteristics of the sample, interventions and context. By synthesizing the results of several interlinked primary studies, they deploy strategies to reduce the bias and random errors (12). Their objective is to discover the differences

and changes between the studies, and to provide the evidence for the development of clinical practice or new discoveries and the findings for establishing the guidelines, or to contribute to the development of theories (13). Systematic reviews also highlight any shortcomings or if the achieved knowledge is sufficient, contributing to the decision of whether research should be repeated or continued, depending on the findings of the results of reviewed studies.

Systematic reviews present an important contribution to science, especially if they are appropriately designed, of a high quality and transparent, and conducted in accordance with the best available knowledge (3). They are designed according to protocol that functions as a guideline for conducting the whole project, and develops the procedures for systematically finding literature and presenting, synthesizing and interpreting the findings (14).

The purpose of the methodology and presentation of systematic review articles with a characteristic high level of abstraction is to avoid subjectivity as much as possible. Measures for including or excluding studies from systematic reviews must be explicitly stated for readers and other researchers using the same approach. Such an explicit approach allows readers to evaluate the author's presuppositions, procedures and conclusions, and to later update and expand the review. All of the above defines the nature of systematic review articles, which is expressed in (13):

- the ability to prepare impartial abstracts with hard and cumulative evidence through reasonable efforts;
- establishing relationships, contradictions, gaps and inconsistencies using the clinical approach and information synthesis from original studies;
- the development and evaluation of new and existing theories;
- obtaining useful knowledge for practice and management;
- establishing guidelines for future research (e.g. emphasizing lack of proof or demonstrating the poor quality of the research);
- measures for inclusion, which should be explicitly presented, with a repeated study bringing completely the same results;
- measures for establishing bias risk.

Systematic reviews bring additional benefit to the researchers developing the field of study, as well as to medical policy-makers who use the findings when preparing guidelines, and doctors who turn to systematic reviews for evidence to use in clinical practice. Systematic reviews employ the procedure of linking the results

from different studies, qualitative, quantitative or mixed research methods (15), impacting on the presentation of effectiveness or success of proof, new findings and the development of new or evaluation of existing theories.

4 Approaches to systematic reviews

Typical systematic reviews are focused on the question of effectiveness and the method of performing the interventions or therapies, providing answers as to whether a certain intervention even works. The intervention is researched in randomized control trials, presenting the gold standard for evaluating the benefits of treatment. Randomized controlled trials rank at the top of the hierarchy of evidence. If there are no such studies available, researchers can also employ evidence from non-randomized or observational studies, which rank lower on the hierarchy of evidence. These provide the answers on the diagnosis, protective factors, processes, methodology and economy. New approaches that are gaining in prominence include those that focus on social interventions and revolve around the question of practice and policy (16).

Studies answer the type of question that directly impacts the approach of systematic reviews. Systematic reviews that came to prominence in the 1990s (17) employed the quantitative approach, and prove the effectiveness of different interventions. The results are analyzed using statistical analysis, especially meta-analysis through which results of individual studies are combined in a systematic manner. Meta-analysis has established the foundations for evidence based medicine. This is a statistical analysis of a large database and the results of individual studies (18), which represents the logical framework for reviewing research. The meta-analysis establishes statistical heterogeneity (variability or dispersion) between studies in the scope of the effect, establishing whether such heterogeneity can be ascribed to another variable in which the studies differed. The core finding of a meta-analysis is that using a uniform metric supporting mutual comparability of the studies extracts the data from several sources, providing support in planning the studies and preparing guidelines (19).

Cochrane has also developed methods for systematic review utilizing a qualitative approach (20). Qualitative systematic reviews have an interpretative role, as their objective is to help formulate the understanding of the phenomena and their relationships. Qualitative systematic reviews research the feasibility of services through a synthesis of qualitative studies, called meta-synthesis. Unlike the meta-analysis, the basic logic behind the

meta-synthesis is more to interpret than to combine the results. Interpretation pertains to a person's individual experience and explaining the phenomena, environment and relationships, and understanding the activities and events. The information for interpretation is obtained from interviews, discussion groups, observations, text analysis, etc. The interpretative paradigm is inductive, with the objective of establishing key concepts and topics, which it then synthesizes with the goal of elevating it to a higher level of understanding, as well as positing or developing theories (21).

The development of qualitative analysis systematic reviews has provided an additional need for a combined approach that focuses on researching the relationship between theory and empirical data.

Combined systematic reviews employ both methods: meta-analysis and meta-synthesis, adhering to both findings of qualitative and quantitative methods. The mixed-method approach is a process of performing the synthesis of two or more types of data, which are then merged into the final combined synthesis (22). We employ this approach when reviewing multidisciplinary topics and want to answer several research questions (10).

5 Steps to conducting a systematic review

The approach to systematic reviews is mostly standardized, with the plan prepared ahead of the research with the aim of reducing bias and subjectivity. The process begins with the research question which must be at the forefront throughout the whole process of conducting the systematic review. The research question is the foundation for the plan for conducting the systematic review, designing the data extraction strategy, defining the criteria for including or excluding studies, evaluating the quality of the studies and preparing the report.

There are five steps to preparing the literature for a systematic review, namely:

1. forming the research question,
2. registering the protocol,
3. the criteria for including/excluding studies,
4. finding and reviewing the literature,
5. selecting the studies and critical assessment, and their detailed description.

5.1 The research question

The research question is an essential element of systematic reviews, which concisely summarizes its main

goals or objectives. The research question is the process that begins with the definition of the theme, formation of the idea and the question's elements. The research question should not be too narrow or too broad in order to be able to employ different tools when developing the research question. Their selection depends on the type of the research question. When performing a systematic review comparing and researching different interventions, we should employ the PICO method, an acronym for population, intervention, comparison and outcomes. With a qualitative approach of a systematic review, we should employ the SPIDER tool, which focuses the question on the study design and the sample, instead of the population. SPIDER is also an acronym, standing for sample, phenomenon of interest, design, evaluation and research type (23).

5.2 Registering the protocol

The research question is generally followed by the protocol. Both represent decisive steps in the process of conducting systematic reviews. The research protocol is used to put together the plan for the preparation and design of the systematic review, and defining the responsibilities of all involved participants. The protocol includes the position, hypothesis, goals, planned methods, extraction strategy, and the criteria for including studies and the results of the systematic review. The protocol is registered in the open access database of protocols PROSPERO, the international database of medical and social studies related systematic reviews. The registered protocol is the text we finally cite in the "Methods" chapter (24). With the database the researcher can establish whether there is already a protocol with similar content. If this turns out to be the case, they should consider whether forming the systematic review is still sensible.

5.3 The criteria for including/excluding studies

The criteria for including or excluding studies defines the content of the systematic review. We can utilize different factors. If the similar systematic reviews that are available complement one another and discuss previous papers in the introduction, it is sufficient to read the latest variant of the study. If we are focused on clinical studies, we have to be mindful of the type of participants and the stage of their disease. This way we determine the effectiveness of a drug therapy for a specific disease progression. It is important which age group they fall in and the location of their examination, such as school, hospital, home, etc. Another important factor

is the geographic location of the study, meaning that we should compare studies that were made under similar geographic and economic conditions. It is also important how studies present their results and whether they employ the appropriate statistical methods. When treating them, we must focus on the types of studies included, as they may utilize different approaches to sampling, the time of measurement, observation, etc. Generally, we only select original studies, and not reviews, editorials, case studies or letters.

5.4 Finding and reviewing the literature

Systematic reviews present and analyze all the existing literature. Generally, this literature is very extensive, as we are examining several database systems. The procedure and the decisions have to be recorded diligently and systematically. The logging data is useful when a part of the procedure needs to be verified, and especially when writing the methodology of the systematic review. The experience of researchers who have performed systematic reviews shows that it is advisable to record the information on the details of the search and the results; studies that were included and excluded when reading abstracts and texts; reasons for including or excluding studies; and finding grey literature (3,25).

When developing the search strategy, we have to consider unambiguous search terms that will yield extensive results among which we can find potentially appropriate studies on the selected topic. The search results are then reviewed and evaluated with regard to our research question and the defined criteria for including or excluding studies. In addition to the articles from databases and systems, we must also review the references of relevant articles, and if needed, turn to researchers from the selected field. A high-quality systematic review also requires that we search the terms of grey literature, such as technical and research reports, reports of government agencies, and research groups (25). Grey literature can be searched in online databases, such as OpenDOAR (open access repository of universities from across the globe), (26), WorldCat (a database of dissertations) (27) and Google and Google Scholar.

5.5 Selecting the studies and critical assessment

When all the searching-related procedures are completed and we have selected the papers/primary sources, we have to review the whole database of papers in order to determine whether each one meets the criteria

for inclusion. The procedure of finding and selecting the studies is carefully recorded. We then establish the methodological quality and the reporting quality of original studies. Recommendations for methodological quality are provided by Cochrane (28). Methodological quality is the assessment of the internal validity and bias of the study, i.e. it informs us how well the study was designed and executed. The parameters used for assessing the quality depend on the type of study. When assessing randomized controlled trials, it is reasonable to establish their bias related to sampling methods, the consistency of performing their tests, the risk factor, and adherence of causal connections. With observational studies it is reasonable to ascertain the bias related to systematic differences, exposure, participant selection, inaccuracy in logging the participants' characteristics, etc. (16).

The quality of reporting relates to the quality of the presentation of the research and results. Several tools and question lists are available for assessing the quality. The Siddaway et al. study on conducting systematic reviews

How to do a systematic review (3) reports that there are 86 tools for assessing the quality of studies, and emphasizes that a universal tool is needed. One of the organizations that collects quality assessment tools is the EQUATOR Network, an international initiative which strives for improving the quality and transparency of medical research.

6 The structure of a systematic review

The EQUATOR Network also provides the PRISMA checklist as the minimum reporting standard for systematic reviews, which encompasses a checklist with 27 questions (Table 1). The PRISMA checklist includes questions regarding the title and the abstract, the structure of the article, the protocol and registration, the eligibility measures, search strategies, study selection, risk assessment, analysis and synthesis. PRISMA is the default value for systematic reviews that include qualitative data on selected and excluded studies across all phases of literature review, and it also provides the number of selected studies

Table 1: PRISMA 2020 Checklist with questions pertaining to reporting on the content of a systematic review and a meta-analysis. Summarized after Page MJ, et al. (30).

Section and Topic	#	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	

Section and Topic	#	Checklist item	Location where item is reported
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	
Risk of bias in studies	17	Cite each included study and present its characteristics.	
Risk of bias within studies	18	Present assessments of risk of bias for each included study.	

Section and Topic	#	Checklist item	Location where item is reported
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	
	23b	Discuss any limitations of the evidence included in the review.	
	23c	Discuss any limitations of the review processes used.	
	23d	Discuss implications of the results for practice, policy, and future research.	
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	
Competing interests	26	Declare any competing interests of review authors.	
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	

suitable for systematic reviews. PRISMA is used by researchers for performing qualitative systematic reviews, although with some adjustments. With a qualitative systematic review, there is less emphasis on establishing bias than with quantitative approach (29).

The PRISMA checklist introduced base criteria for reporting systematic reviews that consist of the following

chapters: introduction, methods, results and discussion.

6.1 The “Introduction” chapter

The “Introduction” chapter poses questions that are very similar to those in research papers, even with the broader spectrum of focus, as it includes questions for

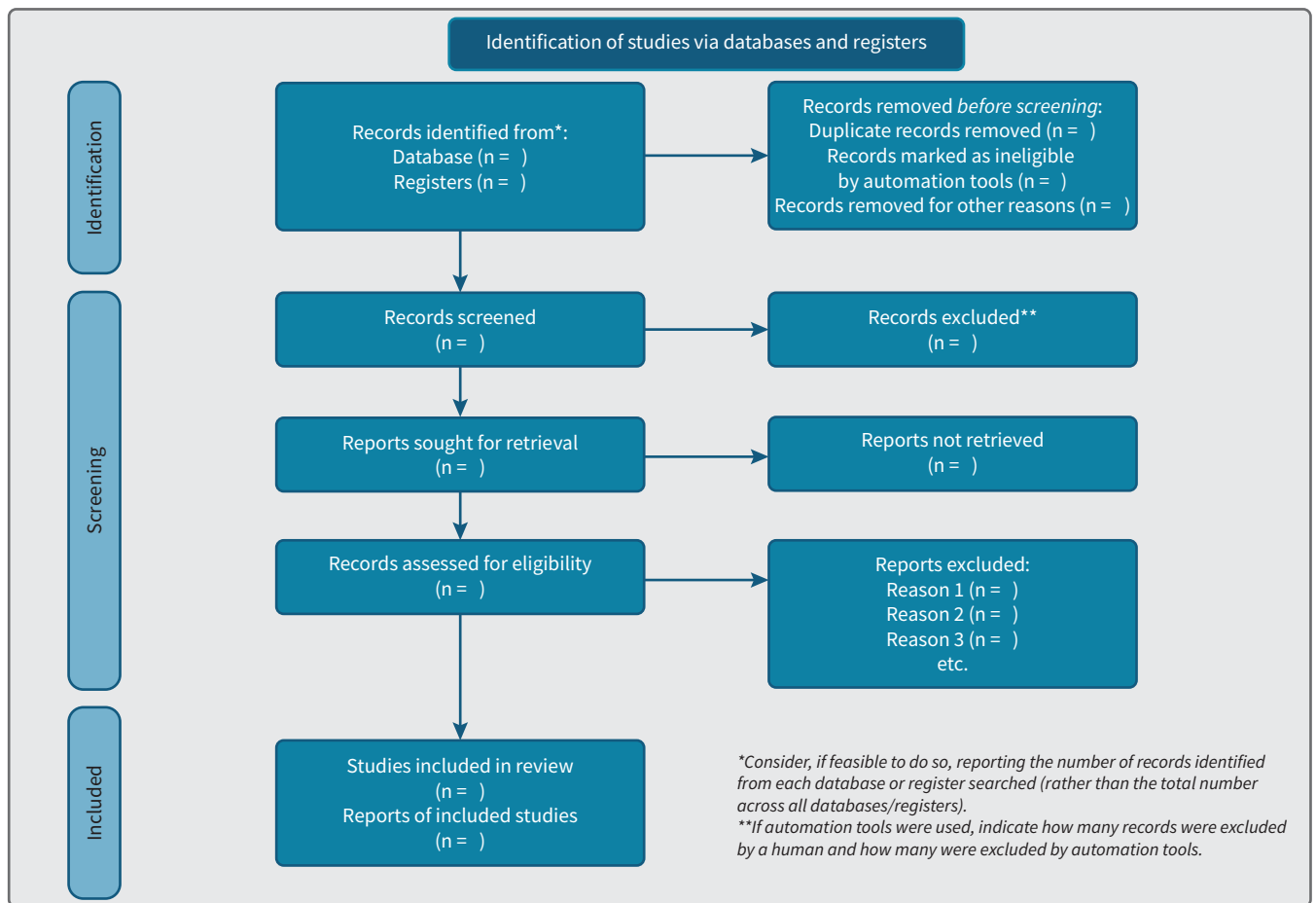


Figure 1: The PRISMA Flow Diagram shows the flow of information across different phases of performing a systematic review. It returns the number of identified, included and excluded pieces of evidence, and the reason for their exclusion. Summarized after Page MJ, et al. (30).

clinical practice, healthcare policy and theory development. In the introduction we state how the review will be structured and what it will include; we present and assess the effects, benefits and purposes of the interventions; we provide a detailed discussion on the need for this systematic review, focused on one or several key research questions, and provide a detailed explanation of key concepts, definitions and information from the review. With qualitative systematic reviews we also present important theoretical concepts and new conceptualizations (4).

6.2 The “Methods” chapter

The “Methods” chapter brings the description of our work for the systematic review. Detailed instructions for the methods or guidelines for systematic reviews are provided by Cochrane and PRISMA, which both emphasize that this section should be divided into several headings. The guidelines recommend that this chapter introduces the data on the criteria for selecting the studies, the

collection, selection, abstracts, measurements of interventions, the data on bias and the method for synthesizing the data and the results. The PRISMA checklist also emphasizes the need for ensuring transparency and result validity. We also have to present the methods for finding the grey literature and the preventive measures taken for reducing the bias and error in the study selection process (31).

The procedure for performing systematic reviews is presented with the PRISMA diagram, which provides quantitative data on the studies in different phases of the process (Figure 1). In quantitative systematic reviews we employ statistical analysis, e.g. meta-analysis, which can only be performed if studies are homogeneous enough. It is used to explain differences between the statistical and clinical significance of the findings. In qualitative systematic reviews we employ the meta-synthesis method for interpreting the findings using the inductive approach, where hypotheses or theories are developed based on observations.

6.3 The “Results” chapter

The “Results” chapter summarizes and critically evaluates the review. The information for results must be presented in an impartial, structured, clear and direct manner, while the findings must follow from the purpose of systematic reviews. We use diagrams and tables, as they are an economical and clear method for summarizing key results.

We must provide a new and improved understanding of the terms, and not only the summaries and syntheses. We also have to justify the results that contradict the hypothesis or the theoretical model. It is important to note that the presence of such proof is not a weakness of the review, because such evidence points to the complexity of reality (3).

The “Results” chapter should also include information on the methodological quality of the reviewed studies. The difference in results occurs with regard to the qualitative and quantitative approaches to systematic reviews. With quantitative systematic reviews we employ statistical analysis and describe the analytical context and methods. With a qualitative approach we employ the interpretative review and special findings (4).

6.4 The “Discussion” chapter

Systematic reviews are a type of paper in which we justify the results and new findings in detail. The findings from the procedure of review preparation must be summarized in a balanced and impartial discussion. The “Discussion” chapter is used for discussing the benefits and limitations of the literature, including by taking into account the scientific quality of the studies, for reporting any derogations, the applicability of the results, etc. We summarize the main results or findings and interpret them. We have to explain how the research included has contributed to the clarification of the research question, as well as the extent to which the new evidence supports existing or creates new knowledge (4). The findings, discussions and validity of the results and any detected limitations, weaknesses and advantages of the systematic review are complemented with a proposal for the current clinical practice and for an upgrade of the current knowledge or a contribution to the conceptual knowledge.

7 Conclusion

In this article we have endeavoured to show how to plan, perform, organize, and write a good systematic

review, which is one of the best methods for summarizing and synthesizing evidence and interpreting the findings on a certain issue. Some fields of medicine use systematic reviews as the main guidelines for the preparation of clinical practice, making them increasingly popular among experts, while journal editorial boards encourage their publication. The importance of systematic reviews is also evident in the development of guidelines and checklists, which are an effective tool in their preparation.

Systematic reviews cannot exceed the quality of the included original papers; therefore, high-quality studies are a precondition for good systematic reviews, which connect the current state of the evidence and findings with the theoretic conceptualization. Comments, conclusions and recommendations for clinical practice, healthcare policy and creating and developing theories in systematic reviews are based on evidence, understanding and interpretation of the findings. Systematic reviews follow protocol; however, they also contribute significantly more, as they are also guided by top scientific principles or recommendations regarding relevant reporting. As the synthesis of the best evidence and interpretations of the findings, they impact the decision-making in important segments of the medical profession and science, and are increasingly gaining in importance in decision-making in clinical practice and healthcare policy, and in interpreting new findings about phenomena (3,31).

Systematic reviews are the “gold standard” of high-quality information, obtained from raw data brought by original articles (32). The production of original information is increasingly growing, and consequently they must be systematically organized to ensure efficient access to them. The procedure of preparing a systematic review is taxing and time consuming, because the high quality of information it discerns comes from highly demanding analysis and synthesis procedures. The support of advanced technologies can contribute effectively to the quality of a systematic review. Their contribution makes the process of preparing a systematic review increasingly more automated. Using technologies and process automation such as extracting papers and data mining contribute to the optimization of preparing studies and reduce the time needed to create a systematic review. This makes it possible to quickly and reliably include new findings and evidence in studies, and provide faster access to them (33). Data mining is a modern technology that also makes it possible to update existing systematic reviews, complementing them with new information. The complex processes needed to prepare a

systematic review and obtain new information therefore contribute to the quality of clinical knowledge (34).

Successful preparation of a systematic review is consequently dependent upon the content of collected biomedical information obtained using effective search

strategies across different search systems and automated process support.

Conflict of interests

None declared.

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