

Writing a Systematic Review

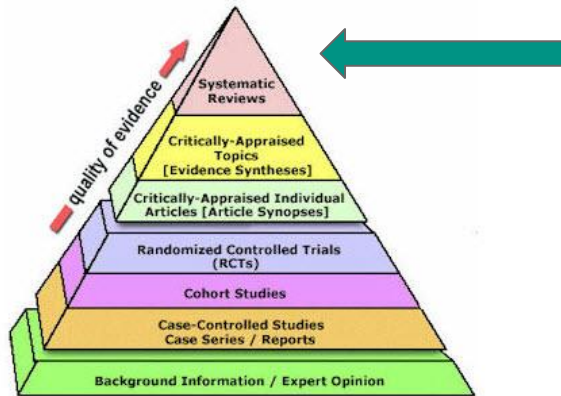
A Research Guide



What is a systematic review?

A systematic review is defined as “a review of the evidence on a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant primary research, and to extract and analyze data from the studies that are included in the review.”

Source: Undertaking Systematic Reviews of Research on Effectiveness. CRD's Guidance for those Carrying Out or Commissioning Reviews. CRD Report Number 4 (2nd Edition). NHS Centre for Reviews and Dissemination, University of York. March 2001.



Systematic reviews reside at the top of the evidence-based medicine pyramid because they involve comprehensive collection, synthesis, and evaluation of the most relevant, high-level research.

“Gathering research, getting rid of rubbish and summarizing the best of what remains captures the essence of the science of systematic review.”

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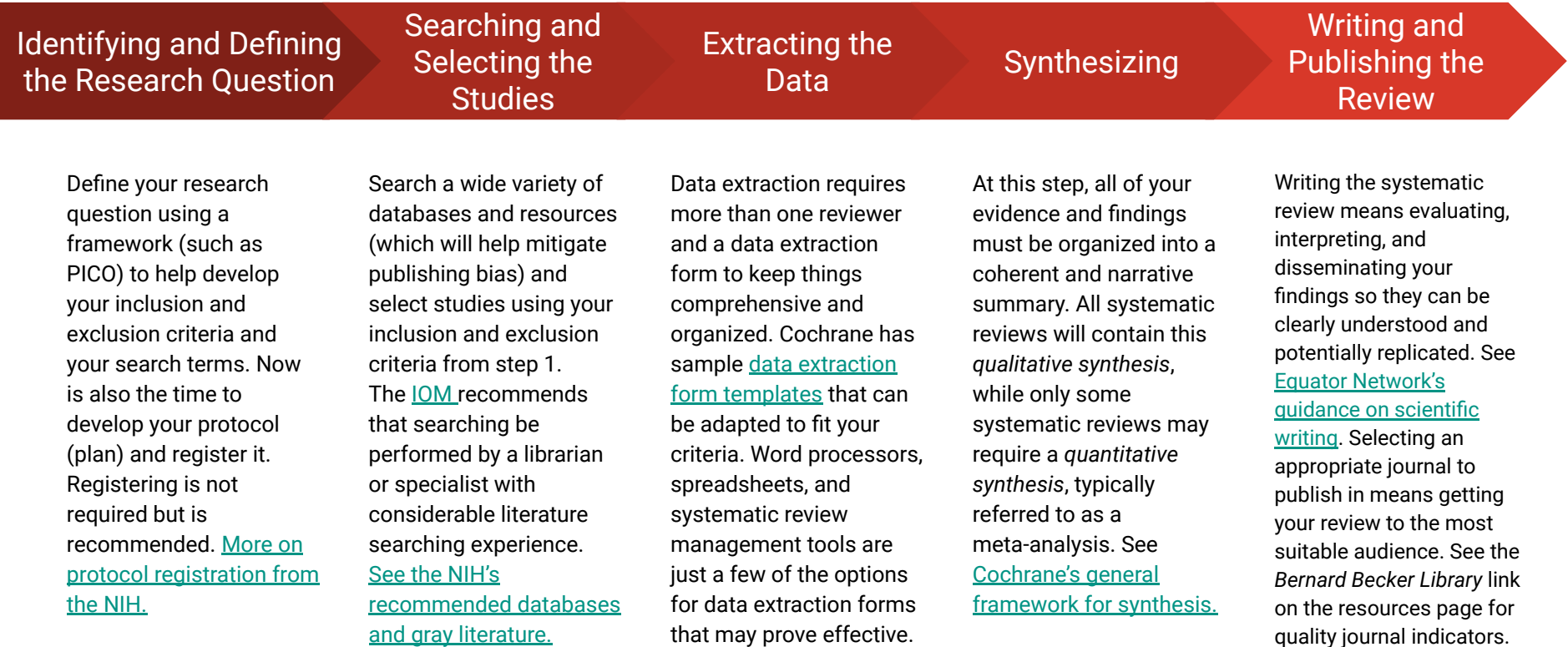
-Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. Health Info Libr J. 2009;26(2):91-108. doi:10.1111/j.1471-1842.2009.00848.x

How does a systematic review differ from a literature review?

	Systematic review	Literature review
Definition	<ul style="list-style-type: none"> High-level overview of primary research on a focused question that identifies, selects, synthesizes, and appraises all high quality research evidence relevant to that question 	<ul style="list-style-type: none"> Qualitatively summarizes evidence on a topic using informal or subjective methods to collect and interpret studies
Goals	<ul style="list-style-type: none"> Answers a focused clinical question Eliminate bias 	<ul style="list-style-type: none"> Provide summary or overview of topic
Question	<ul style="list-style-type: none"> Clearly defined and answerable clinical question Recommend using PICO as a guide 	<ul style="list-style-type: none"> Can be a general topic or a specific question
Components	<ul style="list-style-type: none"> Pre-specified eligibility criteria Systematic search strategy Assessment of the validity of findings Interpretation and presentation of results Reference list 	<ul style="list-style-type: none"> Introduction Methods Discussion Conclusion Reference list
Number of authors	<ul style="list-style-type: none"> Three or more 	<ul style="list-style-type: none"> One or more
Timeline	<ul style="list-style-type: none"> Months to years Average eighteen months 	<ul style="list-style-type: none"> Weeks to months
Requirement	<ul style="list-style-type: none"> Thorough knowledge of topic Perform searches of all relevant databases Statistical analysis resources (for meta-analysis) 	<ul style="list-style-type: none"> Understanding of topic Perform searches of one or more databases
Value	<ul style="list-style-type: none"> Connects practicing clinicians to high quality evidence Supports evidence-based practice 	<ul style="list-style-type: none"> Provides summary of literature on the topic

What are the steps of a systematic review?

The systematic review process is rigorous and complex, and the following graphic is only meant to provide a brief summary of the process. On the following slides you will find more information about database searching and how to develop a search strategy, and on the Resources slide you will find additional, in-depth standards, guidelines, and research guides.



More on Searching...

Developing a search strategy begins in step 1 of the systematic review process, when the research question is defined and the protocol is developed. These frameworks provide the concepts, terms, and constraints that help to shape the search strategy.

The following example demonstrates how to build a search strategy for the research question: **“Is animal-assisted therapy more effective than music therapy in managing aggressive behavior in elderly people with dementia?”** In this example, the **PICO** framework helps to identify the key concepts:

P (patient or population)	I (intervention)	C (comparison or control)	O (outcome)
Dementia	Animal-assisted therapy	Music therapy	Aggressive behavior

The source for this example comes from:

Aromataris, E., & Riitano, D. (2014). Constructing a search strategy and searching for evidence. A guide to the literature search for a systematic review. *The American journal of nursing*, 114(5), 49–56. <https://doi.org/10.1097/01.NAJ.0000446779.99522.f6>

According to [The Cochrane Handbook, 4.4.4](#), a good search strategy uses both free-text terms (synonyms for key concepts) and controlled vocabulary terms (standardized indexing terms.)

The table below shows the original PICO elements with identified **keywords** (synonyms) added:

P (patient or population)	I (intervention)	C (comparison or control)	O (outcome)
Dementia Alzheimer Huntington Kluver Lewy	Animal-assisted therapy Animal-assisted activities Animal-assisted interventions Animal therapy Pet therapy Dog therapy Dog-assisted therapy Canine-assisted therapy Pet-facilitated therapy Aquarium	Music therapy Music Singing Sing Auditory stimulation	Aggression Neuropsychiatric Apathy inventory Cornell scale Cohen Mansfield BEHAVE-AD CERAD-BRSD Behavior Behaviour

Next, selected **indexing terms** are added. The indexing terms (or vocabulary) used to categorize articles in the Cochrane Database are MeSH terms (Medical Subject Headings.) These are denoted by [mh] when using the Cochrane syntax.

P (patient or population)	I (intervention)	C (comparison or control)	O (outcome)
Dementia Alzheimer Huntington Kluver Lewy [mh Dementia] [mh "Alzheimer disease"]	Animal-assisted therapy Animal-assisted activities Animal-assisted interventions Animal therapy Pet therapy Dog therapy Dog-assisted therapy Canine assisted therapy Aquarium [mh "Animal-Assisted Therapy"] [mh Pets] [mh Dogs] [mh Cats] [mh Birds] [mh "Bonding, Human-Pet"] [mh "Animals, Domestic"]	Music therapy Music Singing Sing Auditory stimulation [mh Music] [mh "Music Therapy"] [mh "Acoustic Stimulation"] [mh Singing]	Aggression Neuropsychiatric Apathy inventory Cornell scale Cohen Mansfield BEHAVE-AD CERAD-BRSD Behavior Behaviour [mh Aggression] [mh "Personality inventory"] [mh "Psychomotor agitation"]

Example from: Aromataris, E & Riitano, D 2014, 'Systematic reviews: Constructing a search strategy and searching for evidence', *AJN The American Journal of Nursing*, vol. 114, no. 5, pp. 49-56.

This final table shows the addition of filters, field codes, and shortcuts to our terms and MeSH headings. Using the * with truncated terms allows for different terminology and spellings, :kw denotes a keyword search, :ti,ab denotes a title/abstract search, NEXT denotes proximity,, etc. Your librarian or expert searcher will be familiar with all of these!

P (patient or population)	I (intervention)	C (comparison or control)	O (outcome)
Dementia:ti,ab,kw Alzheimer:ti,ab,kw Huntington*:ti,ab,kw Kluver:ti,ab,kw Lewy:ti,ab,kw [mh Dementia] [mh "Alzheimer disease"]	"Animal-assisted therapy":ti,ab,kw ("Animal-assisted" NEXT activit*):ti,ab ("Animal-assisted" NEXT intervention*):ti,ab "Animal therapy":ti,ab,kw "Pet therapy":ti,ab,kw "Dog therapy":ti,ab,kw "Dog-assisted therapy":ti,ab,kw "Canine-assisted therapy":ti,ab,kw Aquarium:ti,ab [mh "Animal Assisted Therapy"] [mh Pets] [mh Dogs] [mh Cats] [mh Birds] [mh "Bonding, Human-Pet"] [mh "Animals, Domestic"]	"Music therapy":ti,ab,kw Music*:ti,ab,kw Singing:ti,ab,kw Sing:ti,ab,kw ("Auditory" NEXT stimulat*):ti,ab,kw [mh Music] [mh "Music Therapy"] [mh "Acoustic Stimulation"] [mh Singing]	Aggression:ti,ab,kw Neuropsychiatric:ti,ab "Apathy inventory":ti,ab "Cornell scale":ti,ab "Cohen Mansfield":ti,ab BEHAVE-AD:ti,ab CERAD-BRSD:ti,ab Behavior*:ti,ab Behaviour*:ti,ab [mh Aggression] [mh "Personality inventory"] [mh "Psychomotor agitation"]

Example from: Aromataris, E & Riitano, D 2014, 'Systematic reviews: Constructing a search strategy and searching for evidence', *AJN The American Journal of Nursing*, vol. 114, no. 5, pp. 49-56.

Once all desired terms are collected, perform a separate search of each PICO column's terms by combining the group of terms with **OR**. After each column's terms have been searched separately, combine all of those independent searches together in a new search string by using **AND**.

In our example, a search for articles on animal assisted therapy versus music therapy to treat aggression in patients with dementia might look like this:

```
(Dementia:ti,ab,kw OR Alzheimer:ti,ab,kw OR Huntington*:ti,ab,kw OR Kluver:ti,ab,kw OR Lewy:ti,ab,kw OR [mh Dementia] OR [mh "Alzheimer disease"]) AND ("Animal assisted therapy":ti,ab,kw OR ("Animal assisted" NEXT activit*):ti,ab OR ("Animal assisted" NEXT intervention*):ti,ab OR "Animal therapy":ti,ab,kw OR "Pet therapy":ti,ab,kw OR "Dog therapy":ti,ab,kw OR "Dog assisted therapy":ti,ab,kw OR "Canine assisted therapy":ti,ab,kw OR Aquarium:ti,ab OR [mh "Animal Assisted Therapy"] OR [mh Pets] OR [mh Dogs] OR [mh Cats] OR [mh Birds] OR [mh "Bonding, Human-Pet"] OR [mh "Animals, Domestic"]) OR (Music*:ti,ab,kw OR "Music therapy":ti,ab,kw OR Singing:ti,ab,kw OR Sing:ti,ab,kw OR ("Auditory" NEXT stimulat*):ti,ab,kw OR [mh Music] OR [mh "Music Therapy"] OR [mh "Acoustic Stimulation"] OR [mh Singing]) AND (Aggression:ti,ab,kw OR Neuropsychiatric:ti,ab OR "Apathy inventory":ti,ab OR "Cornell scale":ti,ab OR "Cohen Mansfield":ti,ab OR BEHAVE-AD:ti,ab OR CERAD-BRSD:ti,ab OR Behavior*:ti,ab OR Behaviour*:ti,ab OR [mh Aggression] OR [mh "Personality inventory"] OR [mh "Psychomotor agitation"])
```

Note: The source text uses PubMed syntax. Our search string has been translated to Cochrane syntax using [The Polyglot Search Translator](#)

After the final search is conducted, results can be further refined by publication date, study group, etc. according to the limits established in the protocol. Resulting citations should be exported to bibliographic management software where they can be organized and ultimately selected for the review.

Example from: Aromataris, E & Riitano, D 2014, 'Systematic reviews: Constructing a search strategy and searching for evidence', *AJN The American Journal of Nursing*, vol. 114, no. 5, pp. 49-56.

The Polyglot Search Translator: Clark JM, Sanders S, Carter M, Honeyman D, Cleo G, Auld Y, Booth D, Condron P, Dalais C, Bateup S, Linthwaite B, May N, Munn J, Ramsay L, Rickett K, Rutter C, Smith A, Sondergeld P, Wallin M, Jones M, Beller E. Improving the translation of search strategies using the Polyglot Search Translator: a randomized controlled trial. *J Med Libr Assoc.* 2020 Apr; 108(2):195–207. doi: 10.5195/jmla.2020.834. Epub 2020 Apr 1. PMID: PMC7069833. <https://pubmed.ncbi.nlm.nih.gov/32256231/>

Documenting the Search Strategy

It's important to remember that your search strategy *must* be documented and reported in the review so that the search can be reproduced. [The Cochrane Handbook 4.5](#) explains documenting and reporting the search process in depth.

Box 4.5.a from the same text succinctly encapsulates the expectations surrounding documentation:

MECIR Box 4.5.a Relevant expectations for conduct of intervention reviews

C36: Documenting the search process (**Mandatory**)

Document the search process in enough detail to ensure that it can be reported correctly in the review.

The search process (including the sources searched, when, by whom, and using which terms) needs to be documented in enough detail throughout the process to ensure that it can be reported correctly in the review, to the extent that all the searches of all the databases are reproducible.


Systematic Review Resources

General Standards and Guidelines

- [Cochrane Handbook for Systematic Reviews of Interventions](#)
- [Institute of Medicine \(IOM\) Standards for Systematic Reviews](#)
- [PRISMA Guidelines](#)
- [The Centre for Reviews and Dissemination \(CRD\) Guidelines](#)

Searching Resources

- [Systematic Searches #4: Building Search Strategies \(Part I\)](#)
- [Systematic Searches #5: Building Search Strategies \(Part II\)](#)
- [Systematic Searches #6: Building Search Strategies \(Part III\)](#)
- [Systematic Searches #7: Building Search Strategies \(Part IV\)](#)
- [Systematic Searches #8: Building Search Strategies \(Part V\)](#)
- [PubMed Search Strategies Blog](#)



An excellent series of videos from Yale Medical Library outlining the process of building search strategies!

Publishing Resources

- [Bernard Becker Medical Library's "Selecting a Journal for Publication: Quality Indicators"](#)

Systematic Review Resources

Recommended Research Guides from other Libraries

- [University of Maryland's Systematic Review Research Guide](#)
- [Texas A&M University Libraries Systematic Review Research Guide](#)
- [The CDC Library Systematic Reviews Research Guide](#)
- [Temple University's "What is a Systematic Review?" Guide](#)

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