

Systematic Literature Searches and Information Retrieval

A Collection of Teaching Handouts

About These Resources

These materials were developed to support courses and workshops that teach systematic literature search methodology. They cover essential concepts and practical skills needed to plan and conduct high-quality literature searches for evidence synthesis projects. They were created for a health care context but could be adapted for other research areas.

Target Audience

These handouts are designed for anyone teaching or learning systematic search skills, e.g.:

- Health sciences librarians and information specialists
- Instructors teaching systematic search methodology
- Graduate students learning systematic review methodology

Collection Contents

This collection includes three handouts:

1. Types of Searching in the Systematic Review Process

Covers different search approaches (lookup, exploratory, and systematic searches), their purposes, and when to use each method in the context of evidence synthesis.

2. Systematic Database Searching

Provides detailed guidance on planning and conducting systematic searches in bibliographic databases, including search strategy development, search terms, syntax, and documentation.

This document: 3. Supplementary Searching

Explains supplementary search methods beyond database searching, including citation searching, grey literature searching, and trial register searches.

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Suggested Attribution: Irma Klerings, University for Continuing Education Krems, Cochrane Austria



Supplementary searches

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1. Supplementary search methods

Comprehensive systematic searches combine Boolean bibliographic database searches with additional methods and information sources.

The main goals of supplementary searches are:

- Identifying additional published articles that were missed by the database search strategies,
- Identifying documents that are not available in bibliographic databases (e.g., grey literature).

• **Grey literature**

- Grey literature = materials and documents produced by organizations outside of the traditional commercial or academic publishing and distribution channels.
- There are many different types of grey literature: Which ones are relevant for a systematic review depend on the topic and type of question.
Example: Canada’s Drug Agency has a tool for finding sources of health-related grey literature depending on category: <https://greymatters.cda-amc.ca/>
- For systematic reviews, grey literature can be important to:
 - o reduce publication bias, e.g.: trials with significant and positive results are more likely to be published than others, RCTs are more often published than observational studies, etc.
 - o identify additional information not available in published articles

Examples of grey literature types and sources

Production context	Examples of Documents	Examples of Common Sources
Academic: Created at universities or similar institutions, but not published in a journal or book	<ul style="list-style-type: none"> • Theses/dissertations • Conference Papers • Research Reports • Preprints, white papers • Research Posters • Data sets 	<ul style="list-style-type: none"> • University Research Repositories • Conference Proceedings • Preprint servers • Theses databases
Non-academic research and reports: Documents that are created by non-academic organizations, e.g.: think tanks, policy institutes, research centers, governments, NGOs	<ul style="list-style-type: none"> • Policy Briefs • Data sets • Reports on specific programs, areas or topics • Statistics 	<ul style="list-style-type: none"> • Websites and repositories of public institutions or NGOs • Open data portals • Census data
Health research specific grey literature: These types of documents may derive from academic or non-academic research	<ul style="list-style-type: none"> • Clinical trials data • Practice Guidelines • Commissioned evidence syntheses 	<ul style="list-style-type: none"> • Trials registers • Pharmaceutical Companies • Health Professional Associations • Health technology assessment agencies

- **Types of supplementary searches**

Depending on the type of document searched and the topic, different approaches are useful.

Most systematic review guidance requires at minimum:

- Screening reference lists of included studies (= manual backward citation searching)
- For clinical intervention reviews: searching trials registers

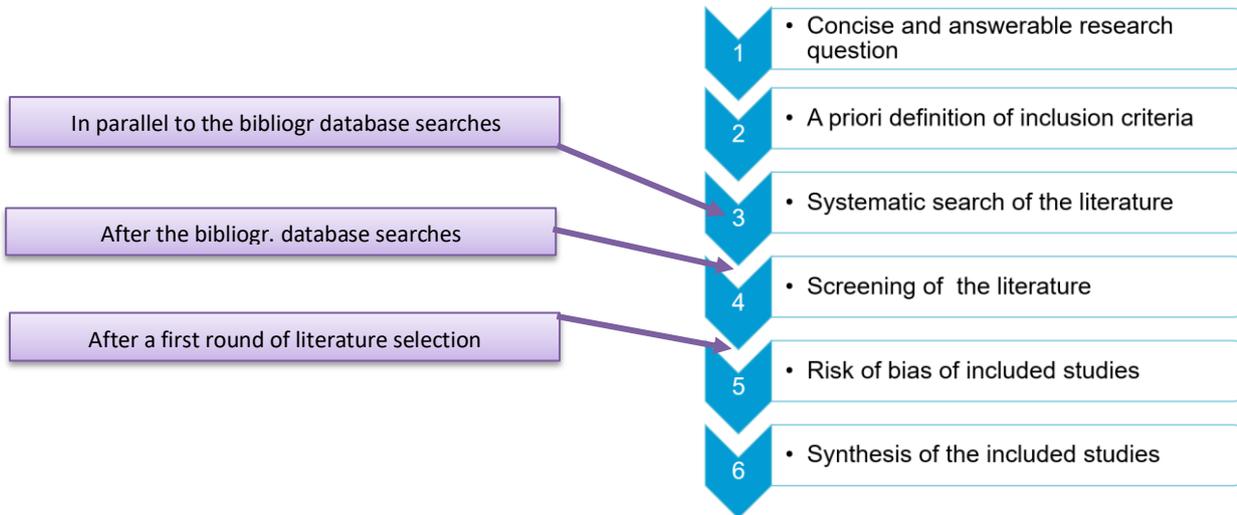
Common supplementary search methods

Method	What is the method used for	Process	Claimed advantages	Claimed disadvantages
Contacting study authors or experts	Identify: unpublished, or on-going studies, missing or incomplete data, completed but unpublished studies	Usually based on studies found via database searching. Contact original investigators through study report contact details.	Additional studies identified; additional study data provided	No guarantee of additional or all relevant information identified Challenging and time consuming Less successful for older studies
Citation searching	Identify: further studies, clusters or networks or studies	Usually based on studies found via database searching. Includes backward and forward citation searching, similar articles searching	Not limited by keywords or indexing as bibliographic database searching is	Reliant on the currency, accuracy and completeness of the underlying citation network
Handsearching	Identify: studies or publications not routinely indexed in, or identified by, searches of bibliographic databases, including recently published studies	Manual examination of the contents of topic relevant journals, conference proceedings and abstracts	Unique study identification, increased sensitivity; identifying studies missed or not indexed in databases	Studies still missed by handsearching; time and access to resources; low precision
Searching trial registers	Identify: unpublished, recently completed or on-going trials Find adaptations to trial protocols reported study outcomes	Boolean searches in national and international trials registers	Additional studies identified; additional study data provided	Search interfaces and export functions are not intended for systematic searching
Web searching	Identify: studies not indexed in bibliographic databases. Retrieving grey literature, study protocols and on-going studies	Relevant websites and search engines	Unique study identification, hints to on-going or recently completed studies	Difficulties in transparent search, quality and quantity of searches returned

(adapted from Cooper 2017, "Table 2 Overview of results", [CC BY 4.0](#): removed irrelevant columns)

- **Timing of supplementary searching**

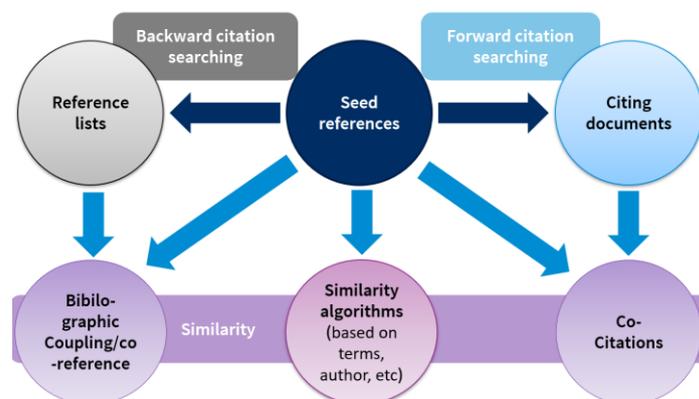
Depending on the method and source used, supplementary searches may take place at different times during the review process.



2. Citation-based searching

- **Types of citation searching**

Citation-based searches start with one or more seed references. They mainly use direct or indirect citation networks to retrieve new documents.



- Backward citation searching finds older documents that are cited in the reference list of the seed document.
- Forward citation searching finds newer documents that cite the seed document.
- Bibliographic coupling finds documents that have similar reference lists to the seed document.
- Co-citation searching finds documents that are cited together with the seed article.
- Other similarity algorithms find documents that share other characteristics with the seed document, e.g. terminology, authors.

- **Use in systematic searching**

Advantage: Independent of search term choice → Can be used to find articles that were missed by the Boolean search strategies

Disadvantages: needs relevant seed references; assumes that relevant studies cite each other and/or use same terminology.

Use cases:

- As part of the exploratory search process: Identification of a first set of relevant references that can be used to develop and test search strategies.
 - ⇒ Can be done iteratively, does not need to be documented.
- Supplementary search method: In addition to Boolean database searching to identify additional studies; mainly finds other published literature but may also identify some grey literature.
 - ⇒ Has to be documented and reported as transparently as possible.

Guidance:

TARCIS provides recommendations for conducting and reporting citation searches (see further reading).

Usefulness depends on the sensitivity of the Boolean database searches:

- Difficult to search for topics: forward and backward citation searching based on all included records using 2 citation indexes is recommended.
- Easy to search for topics: Manual reference list checking of included records can be used to confirm the sensitivity of the search strategy.

Reporting: must include a list of seed references, the type of citation search (forward, backward, etc.), the date of searching, the number of citation-searching iterations, the citation index and platform used, any additional limitations applied, the number of records retrieved

• **Citation indexes**

Most citation-searching requires a database or web platform that contains information about citing and cited documents.

For supplementary searches: Prioritize sources that allow searching more than one reference at the same time and have bulk export options, e.g. citationchaser, Scopus, Web of Science

Scopus: <https://www.scopus.com/> (subscription based)

- backward & forward citation searching, co-references

Web of Science: <https://www.webofknowledge.com/> (subscription based)

- backward & forward citation searching, co-references

Google Scholar: <https://scholar.google.com/>

- similar articles, forward citation searching

PubMed: <https://pubmed.ncbi.nlm.nih.gov/>

- backward & forward citation searching (of PMC articles), similar articles

Connected Papers: <https://www.connectedpapers.com> (freemium model)

- Similarity based on co-references & co-citations

citationchaser: <https://estech.shinyapps.io/citationchaser/>

- backward & forward citation searching, based on data from Lens.org

3. Trials registers

• **Types of trials registers**

Registers can be categorized by

- content: they may contain study protocols, results or both
- source: primary registers where study investigators upload their data; meta registers that combine results from several primary registers
- producer: public agencies, pharmaceutical companies

Examples for trials registers:

Register	Producer	Coverage	URL
EU Clinical Trials Register	European Medicines Agency	Primary register: EU/EWR Public version of EudraCT Database Contains protocols and results	https://www.clinicaltrialsregister.eu
ClinicalTrials.gov	U.S. National Library of Medicine	Primary register: USA and international Contains protocols and results	https://clinicaltrials.gov/
ISRCTN registry	ISRCTN, BioMed Central	Primary register: UK and international Contains protocols and results	https://www.isrctn.com/
International Clinical Trials Registry Platform (ICTRP)	WHO	Meta register: Aggregated data from 20 national registers, e.g. EU-CTR, ClinicalTrials.gov, etc. Contains protocols, links to results	https://trialsearch.who.int/
ScanMedicine	UK National Institute for Health Research, Newcastle University	Meta register: Aggregated data from 20 national registers Contains protocols	https://www.scanmedicine.com/
GSK Clinical Study	GlaxoSmithKline	Primary register: Studies conducted by GlaxoSmithKline Contains protocols and results	https://www.gsk-studyregister.com

- **Advice for trials register searching**

- Search functions are often limited: Keep the search as simple as possible. Ideally, only 1 concept and synonyms (e.g. only intervention terms)
- Check for word- or letter-input limits: If the search string is too long, your query may be cut off. In that case, you will need to run several searches.
- Use more than 1 register despite overlaps in coverage: Differences in search functions can lead to different search results.
- Content accuracy depends on trial investigators keeping the data up-to-date and free of errors. E.g., information about trial status may be outdated, results are often not uploaded.
- Data export: Many trials registers have limited export functions for search results. You may need to use Excel for exporting and screening the search results.
- Reporting: Treat trials registers like bibliographic databases and report your reproducible search strings, the search date and the register used.

- **Search options via other platforms:**

- Cochrane Central Register of Controlled Trials (CENTRAL): contains RCT registry entries from ClinicalTrials.gov and ICTRP, updated once a month
- Embase: as of mid-2025: contains entries from ClinicalTrials.gov, update schedule unclear

Advantages: more robust search and export functions compared to the trials registers

Disadvantages:

- Entries usually don't contain all information that is available in the trials register
- Unclear, if updates to the trials register entry are sent to CENTRAL and Embase

- **Searching ClinicalTrials.gov**

This section includes screenshots of the interface of ClinicalTrials.gov. Bethesda (MD): National Library of Medicine (US), <https://clinicaltrials.gov/>

Basic Syntax:

- Boolean Operators: AND, OR, NOT
- Phrases "..."
- Brackets () for complex search strings
- No truncation possible!

Additional "context operators" are available for the expert search interface, but they are rarely useful: <https://clinicaltrials.gov/find-studies/constructing-complex-search-queries#search-operators>

Simple search interface:

Is generally sufficient for systematic searches:

- Data fields for search terms: condition, intervention, other terms (=all fields)
- Terms within a field: Boolean operators, phrases, brackets can be used
- All data fields are combined with AND
- Has some automated synonym searching, but only using the condition field shows which synonyms will be used.
- Additional filters: Age, Sex, Study phase, study type, etc. (use carefully: data accuracy depends on trial investigators)

The screenshot shows the 'Focus Your Search' interface. Callout boxes provide the following information:

- Population terms:** Points to the 'Condition/disease' field.
- Searches all fields: use if you are unsure which data field to use.** Points to the 'Other terms' field.
- Intervention terms: for new drugs, also include drug codes used by the pharma company** Points to the 'Intervention/treatment' field.
- Filters: include information provided by investigators (e.g., age, study phase), and automatically generated data (e.g. registration date)** Points to the 'Study Status' and 'More Filters' sections.

Search result:

The screenshot shows a search result for 'migraine OR migraines | Ubrogepant OR MK-1602 OR Ubrelyv'. Callout boxes highlight the following features:

- No. of results and search terms, but no fields:** Points to the search criteria and the 'Showing results for' text.
- Bulk export of results:** Points to the download icon in the search filters.
- Search terms and fields:** Points to the search filter input fields.

Documentation: There is no search history that can be conveniently copy and pasted. Make sure your documentation contains the exact search query including all syntax, the fields searched, and the number of results.

Export:

- Complete export of all database fields: CSV, JSON
- Format that can be imported into Endnote, Covidence, etc.: RIS. This export contains a limited number of data fields.

4. Further Reading

- Baudard, M., A. Yavchitz, P. Ravaud, E. Perrodeau, and I. Boutron. "Impact of Searching Clinical Trial Registries in Systematic Reviews of Pharmaceutical Treatments: Methodological Systematic Review and Reanalysis of Meta-Analyses." *BMJ* 356(2017): j448. doi:10.1136/bmj.j448, <https://doi.org/10.1136/bmj.j448>.
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