

## How to Conduct a Systematic, Scoping or Other Review

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This self-paced course covers how to conduct a systematic, scoping, rapid or narrative review. It also breaks down the jargon of these projects into plain English.

### **This Course Will Teach You How To:**

- Differentiate popular review methodologies
- Select appropriate databases and build exhaustive literature searches
- Draft a PRISMA-compliant methods section
- Deduplicate and screen your results
- Find full-text PDFs for your results
- Extract relevant data from your results (called data extraction)
- Complete risk of bias assessment and certainty assessment

## Lesson 1: Review Types, Standards, and the Protocol

Consider this scenario based on actual events:

*You've decided to pursue a systematic review. After searching in PubMed using a handful of key terms, you gather roughly 500 papers and screen through them. You then start writing a manuscript. All in all, it takes three months to get everything done.*

*Next, you submit the paper to various journals, beginning with the most prestigious. However, the reviewers want a PROSPERO registration number and are wondering why items from PRISMA are missing. They also point out papers that your search missed. You and your team aren't sure how to answer the critiques. Your paper is ultimately rejected.*

This is a common predicament teams find themselves in. It's understandable -- review methodology training isn't common in undergrad or even graduate school.

Compounding this is the fact that there are [some serious quality issues with reviews](#), and reviewers and editors typically aren't experts on searching, so the peer review process can't always vet your search. This makes your life even harder, because it means you necessarily can't look to existing literature as examples.

So what are your options? After all, it's crucial that these projects are done well. They are highly trusted, often cited in the news, and are considered one of the highest forms of evidence. Clinicians frequently look to them as models for patient care for that very reason. Well, taking this course is a fantastic first step. Completing this training will ensure your paper does not fall into the traps outlined above.

As you read, you'll see there are quite a few requirements for conducting a high-quality review. Don't let that scare you off! These are still excellent projects to pursue. After all, systematic reviews seek the truest, most unbiased answer to a question, and ultimately, the truth matters. Added bonus: they look great on a CV.

In this first lesson, we'll cover the background information you'll need to decide which review type is right for you and how to get started on your project.

### What are Comprehensive Reviews?

Comprehensive reviews are exhaustive, methodical searches of the literature on a well-defined question. They seek to find **all available literature** on a topic AKA every paper on a topic.

Comprehensive reviews are time-consuming and take typically a year to complete. They require a team of at least three people: two independent reviewers to go through the citations and a tiebreaker to resolve any disagreements between the screeners. Because the search is exhaustive, you should expect to screen thousands of citations.

[This video](#) from University of Pittsburgh also offers an excellent overview of who should and shouldn't pursue this type of project.

The number one mistake groups make is having an unrealistic timeline. Systematic searching can't be taught in an hour. Your search or protocol can't be reviewed in 30 minutes. This will be a marathon, not a sprint. Remember that many comprehensive reviews are abandoned. If you haven't allotted enough time to do your project, the likelihood that it will be orphaned becomes a lot higher.

**Box 2.3.b: Timeline for a Cochrane review**

| Month  | Activity                                        |
|--------|-------------------------------------------------|
| 1 – 2  | Preparation of protocol.                        |
| 3 – 8  | Searches for published and unpublished studies. |
| 2 – 3  | Pilot test of eligibility criteria.             |
| 3 – 8  | Inclusion assessments.                          |
| 3      | Pilot test of 'Risk of bias' assessment.        |
| 3 – 10 | Validity assessments.                           |
| 3      | Pilot test of data collection.                  |
| 3 – 10 | Data collection.                                |
| 3 – 10 | Data entry.                                     |
| 5 – 11 | Follow up of missing information.               |
| 8 – 10 | Analysis.                                       |
| 1 – 11 | Preparation of review report.                   |
| 12 –   | Keeping the review up-to-date.                  |

*Example timeline for a systematic review from the Cochrane Collaboration*

Due to their time-intensiveness, systematic reviews are an unrealistic choice for a school project or summer internship. Students should consider doing a narrative review, defined in the next lesson.

Reviews that fall under the comprehensive review category include but are not limited to:

- Systematic reviews with or without a meta-analysis\*
- Scoping reviews
- Umbrella reviews
- Realist reviews
- Living reviews
- Prognostic reviews
- Psychometric reviews
- Rapid reviews

\*To perform a meta-analysis on top of your systematic review, consult qualitative researchers or biostatisticians.

## **What are Non-Comprehensive Reviews?**

Projects that are not considered comprehensive include:

- Narrative reviews also called critical reviews
- Quality improvement projects
- Searches used to contextualize original research

Non-comprehensive projects don't have exhaustive searches and do not seek to find all available literature. They take less time to complete and don't require a protocol. You don't need to take the entire course if you're conducting any of these. Instead, choose one of the lessons that talk about creating a Medline search. If you're performing a narrative review, read the next lesson on narrative reviews.

## **What are the Defining Features of a Comprehensive Review?**

Three qualities define a comprehensive review:

### **1. Comprehensiveness**

This means the literature search is exhaustive – using **four or more databases** (Medline, Embase, Web of Science, Cochrane, and sometimes others). It must be a robust strategy recorded in a multi-page appendix. If you can fit your entire search strategy into your abstract or manuscript, it's not exhaustive.

Comprehensive searches ensure no paper is missed to avoid cherry-picking. Conversely, non-comprehensive projects won't capture all of the literature.

### **2. Reproducibility**

The search must be reproducible. In other words, if you perform the search Monday at 4 pm and Tuesday at noon, assuming nothing new has been added to the databases, your search must return the same number of results. Reproducibility means the methods of your paper can be repeated and validated.

### **3. Transparency**

Searches must be documented thoroughly. This means someone could recreate your searches using the information in your published manuscript and supplementary materials and validate your findings. Following reporting standards ensures transparency.

## Choosing a Specific Review Methodology

The next decision is what type of comprehensive or non-comprehensive review to pursue. There are many review types beyond scoping and systematic reviews. This [article](#) lists 14 different ones!

Review names can be misleading. Scoping reviews are frequently mistaken to be non-systematic. A scoping review takes as much time and effort as a systematic review. Scoping doesn't refer to the time commitment. It refers to the research question being asked.

Another confusing name is "rapid review." Rapid reviews are done because the research needs to get out quickly (COVID, e.g.). You'll follow the same steps as a systematic review, but take some pre-approved shortcuts for the sake of time and document where you did so.

Always read the guide for your specific review type (listed later in this lesson) to be sure you know what is involved in the project. You can also read the aforementioned [article](#) to get an understanding of the differences between the different types.

## How Many Papers Should I Expect to Screen?

Because the searches for comprehensive reviews are exhaustive, you should typically expect to screen **at least 1,000 papers**. Unless you're fluent in PubMed's search language, quick searches won't give you a good idea of screening numbers, as the search will include more than just one database. Quick searches also aren't robust and can contain errors impacting the number of results you get back. Even if you haven't seen a lot of papers published on your topic, that doesn't necessarily equate to a smaller screening number.

## What About AI?

If you're considering using generative AI in your review proceed with caution. First, you'll be required to disclose this usage. Part of this disclosure is agreeing to be responsible for the accuracy of the tool's work.

Locate your publisher's policy regarding generative AI usage first. Below are major publishers' policies:

- [Elsevier](#)

- [Emerald Publishing](#)
- [JAMA](#)
- [Nature](#)
- [PLOS One](#)
- [Sage](#)
- [Taylor & Francis](#)
- [Wiley](#)

Additionally, the International Committee of Medical Journal Editors (ICMJE) requires [disclosure of AI usage and a description of how it was used](#). If AI was used for writing assistance, you must include the tool in your acknowledgments. If it was used for data collection, analysis, or figure generation, it needs to be mentioned in the methods section.

Never ask the AI tool to do the literature search for you, or even craft the search strategy. AI tools are prone to "hallucinations." In other words, if it doesn't know something, it will lie. There have been many instances where an AI tool performs a literature search for someone, and [the papers it cites are fake](#). Or, it creates a search strategy with [fake MeSH terms](#). Since your disclosure includes responsibility for the tool's accuracy, what this means is if the chatbot lies, it's on you.

Also, be careful about feeding the AI tool copyrighted materials (for example, asking the tool to extract data from a PDF). You'll need to make sure the license to the material allows for AI processing. Publishers are litigious so you'll need to be very careful with any material you don't have specific rights for.

AI is best used for simple, rule-based tasks. In later lessons, we'll cover specific moments where you could safely use an AI tool to help you. Finally, make sure to follow any institutional rules.

### **I've Used PubMed So I Know How to Search, Right?**

You might think: *I've searched in PubMed before. How much more do I really need to learn?* This is a huge misconception among many reviewers.

Searching is often thought of as some keywords thrown into PubMed. This couldn't be further from the truth. To search, you're going to need to learn multiple database languages. These are called **markup languages**.

Another common markup language is HTML which is what's used to build websites. Knowing HTML or any other markup language is actual computer coding. You'll need to master unique database languages to create a search that follows all the necessary standards and captures all literature on your topic.

## Finding Additional Papers Using "Other Methods"

In addition to the database searches, comprehensive review authors are encouraged to find even more papers on your topic using "other methods." This includes looking through reference lists, finding out who has cited papers you've found, contacting authors, hand searching, etc.

**Hand searching** refers to manually examining journal volumes to find subsequent letters on a paper or other related papers.

**Citation chasing** means finding who cited a particular paper and reading the reference lists of papers. To perform citation chasing, upload a list of your final selected articles into a tool like [Citation Chaser](#) or [Snow Globe](#).

## Reporting Standards for Comprehensive Reviews

Reporting standards are checklists with a list of items your paper must include. The [PRISMA Statement, Checklist and Flow Diagram](#) are a set of standards that address what should be reported in a review. Many journals expect authors to use the PRISMA statement; some require you to submit a PRISMA checklist and flowchart with your manuscript.

Researchers often get confused by this and write, "This paper was conducted according to PRISMA standards," when what they should say is: "This paper was *reported* according to PRISMA standards."

The main checklist is used for most comprehensive reviews, with one exception. Scoping and rapid reviews follow different checklists:

- [PRISMA for Scoping Reviews](#)
- [PRISMA for Rapid Reviews](#)

PRISMA's website also includes [an example of good reporting](#).

## Flow Diagram

The PRISMA flow diagram is used to tally the papers found. It records the number of duplicates in the search, the number of papers screened, papers excluded during screening, etc.

PRISMA lists [four diagrams](#). Use the first or second. The rest are for published updates to reviews. The second option includes a box for tracking papers found using methods beyond the literature search (the aforementioned “other methods”). Other methods, if you’ll recall, include citation chasing, contacting authors for missing data, and/or hand searching.

## Guides

The following guides will direct you on conducting your project (this is what people mix up with PRISMA!). These are also called “conducting standards.” Remember also to check the “For Authors” page of any journal you intend to submit, as they may have separate rules to follow. You’ll list which guide you followed in your protocol.

Below are guides for common review types:

### Systematic review:

- [Finding What Works in Healthcare](#)
- [Cochrane Handbook](#) and [Methodological Expectations of Cochrane Intervention Reviews \(MECIR\)](#) (necessary only for Cochrane reviews but provides good advice, especially for risk of bias assessment)

### Scoping review:

- [Joanna Briggs](#) (you’ll only need to read the chapter on scoping reviews)

### Rapid review:

These guides are especially helpful because they explain where you’re allowed to take “shortcuts” to accelerate the process.

- [Cochrane guidebook for rapid reviews](#)
- [National Collaborating Centre for Methods and Tools' recommendations](#)

The literature search has its own set of guidance that we’ll cover in later lessons (PRESS and PRISMA-S).

## The Protocol Process

A comprehensive review requires a protocol. Whether one exists is on the PRISMA checklist, so you must produce one to say your review followed PRISMA guidelines. A protocol will detail your methodology and must follow the [PRISMA for](#)

[Protocols \(PRISMA-P\) checklist](#). You won't need a protocol for a narrative or critical review.

This course contains a template that includes all the necessary items from the PRISMA for Protocols checklist. Always follow the protocol checklist or our included template. This will prevent you from writing a "love letter protocol," where you're just writing about how important the topic is and not addressing anything related to methodology.

PROSPERO reminds its users that **PROSPERO registration is not the same thing as a protocol**. When you fill out the PROSPERO registration form, it will also ask you to upload a PDF or Word document of your full protocol.

If the project is a systematic or rapid review, register it in [PROSPERO](#). A protocol for any other review type should be uploaded to [OSF](#) or [Figshare](#).

PROSPERO dictates that you cannot begin data extraction until you receive approval. Data extraction is the last step for your project, after you screen through the titles and abstracts of your papers (step 1) and screen through the full text (step 2). You can, however, begin title/abstract and full-text screening.

The protocol will describe in future tense how you plan to conduct your project. You'll also need to include a draft list of inclusion and exclusion criteria and what data you plan to extract with your protocol. Below are common inclusion and exclusion criteria. **Make sure to personalize these.** Instead of saying "wrong setting," for example, you'll write something like "Study does not take place in an ICU":

- Surveys/interviews do not assess your topic
- Wrong disease/population (wrong age group or other characteristic)
- Wrong intervention/comparison
- Wrong outcome(s)
- Wrong setting
- Wrong study aim/objective
- Not an original research article
- Wrong study design
- Duplicate data/study
- Full text not available or poster/abstract only
- Full text not in English, and no interpreter was available
- Paper was retracted, and the retraction reason was checked
- Sponsorship/funding source creates a conflict of interest
- Group differences at baseline
- Inadequate data analysis
- Issues with the method of recruitment
- Issues with reported outcomes (selective outcome bias)

- Lack of randomization/randomization was broken (no intention-to-treat analysis)
- Lack of blinding/blinding was broken
- Lack of outcome data
- No protocol when the study design requires it
- No surveys or interviews included
- Too many differences between the study's protocol and manuscript that are not justified
- Too many dropouts
- Too short follow-up period
- Too small sample size

## **Making Sure Your Topic is Novel**

You can look up your topic within PROSPERO to ensure no one else replicates your work. There are several reasons to do this:

- Ensure that you're not needlessly duplicating past work
- Help you describe how your review will uniquely contribute to the field (if there are existing reviews) or how it will fill a gap (if there are no existing reviews)
- Give you ideas on how to structure your search strategy or final report

To do this, go to [PROSPERO](#) and type your topic into the box labeled "Search PROSPERO." Read through the results and determine how your project is different.

## **Next Steps**

You are now equipped with all the information you'll need to decide whether to pursue a comprehensive review and which review type is right for you. In the following lessons, we'll cover how to begin planning, designing, and executing the literature search.

## Lesson 2: Narrative Reviews

This lesson is for people interested in pursuing a narrative review. You can skip this section if you plan to conduct a systematic, scoping, or rapid review.

### What is a Narrative Review?

A **narrative review** (sometimes called a **critical review**) is an option if you don't have the capacity or resources to conduct a comprehensive review. Narrative reviews are not exhaustive in their searches. This means they do not gather all of the literature on a topic, unlike systematic, scoping reviews and the like.

Narrative reviews are based on an expert's (your) opinion, and there is no grading of the literature found in the search. Because of this, narrative reviews contain more bias than a comprehensive review, and the conclusions of narrative reviews are expert-based rather than evidence-based.

Here are some major differences between narrative and comprehensive reviews:

| <b>Narrative review</b>                                   | <b>Comprehensive review</b>                        |
|-----------------------------------------------------------|----------------------------------------------------|
| Can be done by one person                                 | Requires a team                                    |
| Can be done as a school project                           | Cannot be done as a school project                 |
| Search includes one database                              | Requires searches in 5+ databases                  |
| Finds some literature on a topic                          | Finds all literature on a topic                    |
| Does not require grading or appraisal of literature found | Requires grading and appraisal of literature found |
| Contains some bias                                        | Has strict rules to reduce outcome bias            |
| Expert-based                                              | Evidence-based                                     |

[Collins et al.'s paper](#) describes a narrative review thusly:

*Narrative reviews... do not necessarily state or follow rules about the search for evidence [nor do they] reveal how the decisions were made about relevance of studies and the validity of the included studies... [T]he results of the search, selection and assessment procedures must meet the referees' and editors' sense of propriety, but readers may not be privy to the methods and thus could not make judgments about the authors' choices.*

This does not mean a narrative review is a poor methodology. Narrative reviews are a great option if you're short on time or team members, completing a school project, or if you want to determine if there is enough literature to pursue a comprehensive review down the road.

## What Standards Should I Follow?

Unlike comprehensive reviews, you do not need a protocol, nor do you need to follow PRISMA when drafting a narrative review. [SANRA](#) is a proposed set of guidelines for narrative reviews that includes a checklist. Reading this will give you an idea of how to structure your manuscript.

## The Literature Search

You only need to search within one database. The best choice for that database will be Medline using the PubMed interface. To learn how to design and execute a search strategy within Medline, check out the lessons called "Creating a Medline Search."

You will need to be transparent about how you searched. Include in your paper:

- The database (Medline) and platform (PubMed) you searched
- The month, day, and year you ran your search
- The full search strategy

## Manuscript Template

The following template can be reused and/or modified for your paper:

For the literature review, we conducted a search in MEDLINE via PubMed on **MONTH DAY YEAR**. The search strategy is documented in Table 1. All publication types, including case reports and conference abstracts, were included in the search.

Table 1:

### **COPY AND PASTE FULL SEARCH STRATEGY**

## What About Peer Review?

When submitting your paper, your manuscript should not fall under the same category as systematic, scoping, or other comprehensive reviews and should not be peer-reviewed as such. Read the "For Authors" section of your intended journal

carefully. Make sure you submit your paper to the right category.

It can be confusing because many journals use the word "review" in those sections. Look for the word "narrative review" or "critical review" explicitly stated. Also, if you see any mention of PRISMA, the journal is talking about comprehensive reviews, and you should not submit your paper as that article type.

You don't want your paper getting mixed up with a comprehensive review because that means peer reviewers will start asking you about missing elements. Some peer reviewers may not be educated on the differences between these methodologies. If that happens, explain that your paper is a narrative review and send them the [SANRA](#) guidelines as evidence of your methodology.

### Lesson 3: Create Your Research Question

An essential part of this process is developing your research question. You must follow the appropriate question development framework for your review type. Not only is this type of framework required, but it will make searching much easier as it gives you an outline for your search.

Question frameworks keep your question under control. You need a singular focus for this type of project because you're finding everything that has ever been published on your topic. Think of it this way: let's say you were to travel across the globe on a massive journey to find everything you could find about cold brew coffee. Big adventure, right? But give yourself enough time and you can do it. But if, say, you were to travel across the globe trying to find everything there is to know about all drinks in the world, you'd never finish. This is why a focused question is so important. It's the difference between you trying to review 17,000 papers and then giving up, or getting a published paper.

If you use a different framework than the one recommended for your review type, provide an explanation as to why.

#### PICO

Narrative, systematic, and rapid review questions are framed using the acronym PICO, which stands for:

|                                 |                                                                                                                                                                                 |                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>Population</b>               | The "who." It could be a disease, patient population or other group. Think about the characteristics of this group such as their demographics, symptoms, disease severity, etc. | Nurses in the OR                  |
| <b>Intervention</b>             | The proposed treatment or prognostic factor being examined.                                                                                                                     | Handwashing with chlorhexidine    |
| <b>Comparison (optional)</b>    | A second treatment, factor, or condition to compare against the intervention. It can also be a placebo.                                                                         | Handwashing without chlorhexidine |
| <b>Outcome</b>                  | A result or effect of your intervention.                                                                                                                                        | Reduced surgical site infections  |
| <b>Type of study (optional)</b> | Which study designs you will limit to.                                                                                                                                          | RCT                               |

## **PCC**

PCC is used to frame scoping review questions. It stands for:

|                   |                                                                                                                                                                                 |                              |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Population</b> | The "who." It could be a disease, patient population or other group. Think about the characteristics of this group such as their demographics, symptoms, disease severity, etc. | Women with esophageal cancer |
| <b>Concept</b>    | The proposed treatment or prognostic factor being examined.                                                                                                                     | Radiation therapy            |
| <b>Context</b>    | The "where." It could be a location or setting.                                                                                                                                 | Low-income countries         |

## **Other Frameworks**

There are other frameworks you can follow such as:

## **PEO**

|                   |                                                                                                                                                                                 |                    |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| <b>Population</b> | The "who." It could be a disease, patient population or other group. Think about the characteristics of this group such as their demographics, symptoms, disease severity, etc. | Incarcerated youth |
| <b>Exposure</b>   | A risk factor or exposure to a disease, such as a sedentary lifestyle. This could also be a service or type of screening.                                                       | Substance abuse    |

|                            |                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
|                            | treatment                                                                                                                                   |
| <b>Outcome or Response</b> | A response to the treatment or any other measurable outcome such as attitude to treatment, experience, quality improvement, etc. Recidivism |

### **SPICE**

|                     |                                                                                              |
|---------------------|----------------------------------------------------------------------------------------------|
| <b>Setting</b>      | The "where." It could be a location or setting. Emergency department                         |
| <b>Perspective</b>  | The viewpoint being examined in your paper, such as that of a patient or provider. Residents |
| <b>Intervention</b> | The proposed treatment or prognostic factor being examined. Rounding checklists              |
| <b>Comparison</b>   | A comparison treatment or factor. No checklist                                               |
| <b>Evaluation</b>   | The efficacy or results of your intervention. Increased productivity                         |

### **SPIDER**

|                      |                                                                                                                                                                                                         |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sample</b>        | The "who." It could be a disease, patient population or other group. Think about the characteristics of this group such as their demographics, symptoms, disease severity, etc. Patients with bipolar I |
| <b>Phenomenon</b>    | A behavior or experience. Experiences of involuntary hospitalization                                                                                                                                    |
| <b>Design</b>        | How data will be collected. Interviews                                                                                                                                                                  |
| <b>Evaluation</b>    | The results or effects being examined. Traumatization                                                                                                                                                   |
| <b>Research type</b> | Whether your research is qualitative, quantitative, mixed methods, etc. Qualitative                                                                                                                     |

## **Dos and Don'ts of Question Development**

- **Be specific.**

Try to keep your acronym letters very specific. It's better, for example, to look at a specific type of cancer than all cancers. Not only will this help manage your result numbers, but broad categories make screening tough. If you were to choose all cancers, are you familiar with the hundreds of different cancer types? Would you get tripped up by a paper talking about Sister Mary Joseph nodules and have to look it up? These are all things to consider when you are tempted to have broad elements in your question.

- **Do create a question with intention.**

If you decide to deviate from PCC or PICO, provide an explanation as to why you chose a different framework and how the choice informs your review.

- **Don't pose a broad question.**

An overly broad question will bring back 10,000+ papers or so much that the project is no longer viable. Furthermore, you'll be comparing apples to oranges as you screen.

It's not uncommon for groups to have larger-than-life ideas. This is normal; people are excited about their projects and want to make a splash with their research. But what matters most is whether your topic can realistically be done. You could have the most important topic in the world, but if it brings back an unscreenable number of results, it will never reach publication.

Think of it this way: say you were looking for an apartment and asked your broker to find all apartments in Massachusetts under \$5,000 a month. Your results would be massive! You'd need to add more criteria to your search. It's the same with your research question.

- **Don't pose an overly narrow question.**

On the other hand, let's say you want an apartment in JP, next to the Forest Hills stop, with an in-unit washer/dryer, central AC, and under \$2,300 a month. That's too specific; you'll find nothing. You have to figure out what to drop from your search. Similarly, your question can't have so many stipulations that nothing has been written on it.

Be aware that it's much more common for teams to have questions that are too broad than narrow, so this is less likely to happen.

- **Do keep your PICO items singular.**

Many teams have an "everything but the kitchen sink" approach to their question. For example, they try to pack in seven outcomes under their PICO's "O." That won't work for this type of project. Your question will become too broad, and screening will be a nightmare since you don't have a clear picture of what papers to include. Stick to just one outcome, one patient population, etc.

- **Do pose an answerable question.** A clearly defined question that follows PICO or PCC will help with this. Cochrane warns that if you ask an unanswerable question, you'll end up with an "empty review" -- one that finds no studies eligible for inclusion.
- **Don't use a systematic review question to test a hypothesis.** Read what Harvard librarians have to say about this:

*"Systematic reviews are poor tools for hypothesis generation: for instance, to determine what interventions have been used to increase the awareness and acceptability of a vaccine or to investigate the ways that predictive analytics have been used in health care management. In the first case, we don't know what interventions to search for and so have to screen all the articles about awareness and acceptability. In the second, there is no agreed on set of methods that make up predictive analytics, and health care management is far too broad. The search will necessarily be incomplete, vague and very large all at the same time."*

## Lesson 4: Create the Methods Section and Search Appendix

Details about the literature search will be recorded in three different documents:

- An appendix documenting the full search strategies
- A methods section describing how you conducted the search
- PRISMA flow diagram tracking all papers found

We will be covering how to create the first two of these. Filling out a PRISMA flow diagram will be discussed in a later lesson after you have the necessary numbers to fill it out.

### Standards to Follow

Proper documentation is essential for PRISMA compliance, and you must include all items listed on the [PRISMA for Searching](#) checklist in your appendix and methods to describe the literature search.

The search strategy itself has even more standards to follow! We'll discuss those in the next lesson.

### Supplement with the Search Strategies

You will also need your complete search strategies for PRISMA compliance. When your paper is published, this is frequently placed in the supplementary materials section. You will need:

1. Each database (ex: CINAHL) and corresponding platform (ex: EBSCO) searched
2. The entire search strategy for each database, line by line

A **database** is a collection of papers (for example, Medline). A **platform** is the interface you used to search those papers (for example, PubMed or Ovid). It's like how you can access Instagram from both the app and the website. Those are different platforms used to access the same thing: Instagram.

### Methods Section

Use the [PRISMA standards](#) and [PRISMA extension for searching](#) to draft this. Be sure to include:

- Each database and platform searched

- The month, date and year all searches were run. Make sure to export the results of all of your searches on the same day.
- Citations for the standards (PRISMA) followed
- Citations for any software programs used
- Where to find the complete search strategy (Supplement or Appendix 1)
- Any limits used, justification for using them, and credit to the person who created the limit using a citation

Below are databases and the platforms you'll be using to search them:

| Database         | Platform You'll Be Using |
|------------------|--------------------------|
| Medline          | PubMed                   |
| Embase           | Elsevier                 |
| Core Collection  | Web of Science           |
| Cochrane CENTRAL | Ovid                     |

## Sample Methods Sections

Below are samples that you can tailor and reuse for your project. Words in bold are subject to change based on your project. Other things may differ in your methods from the samples provided, such as the databases you used and date limits.

Citations are in APA style and platforms for databases are placed in parentheses.

### Systematic Review

This review was reported according to the PRISMA statement (Page et al., 2021). Electronic searches for published literature were conducted using Medline (PubMed), Embase (Elsevier), Core Collection (Web of Science) and Cochrane Central Register of Controlled Trials (Ovid). The searches were run in **MONTH DAY YEAR**. The search strategy incorporated controlled vocabulary and free-text synonyms for the concepts of **CONCEPT** and **CONCEPT**. The complete database search strategies are documented in Appendix 1. No restrictions on language or any other search filters were applied.

### References

1. BMJ (OPEN ACCESS) Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

### Scoping Review

This review was reported according to the PRISMA for Scoping Reviews extension (Tricco et al., 2018). Electronic searches for published literature were conducted using Medline (PubMed), Embase (Elsevier), Core Collection (Web of Science) and Cochrane Central Register of Controlled Trials (Ovid). The searches were run in **MONTH DAY YEAR**. The search strategy incorporated controlled vocabulary and free-text synonyms for the concepts of **CONCEPT** and **CONCEPT**. The complete database search strategies are documented in Appendix 1. No restrictions on language or any other search filters were applied.

## References

1. Tricco, AC, Lillie, E, Zarin, W, O'Brien, KK, Colquhoun, H, Levac, D, Moher, D, Peters, MD, Horsley, T, Weeks, L, Hempel, S et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169(7):467-473. doi:10.7326/M18-0850.

## Lesson 5: Create Your First Search in PubMed

In this lesson, we'll cover how to design and execute the first database search in PubMed. The search we'll create isn't transferable to any other database, so in the lessons after this, you'll learn how to "translate" it to Embase, Web of Science, and Cochrane. Learning to search is similar to learning a new language or trying to solve a puzzle. You'll use critical thinking, problem-solving, and troubleshooting skills.

It's essential to learn search coding because if you don't "speak" to the database in its language, the search won't run or won't run in the way you expect it to. Check out what happens when you type a question into PubMed:

History and Search Details Download Delete

| Search | Actions | Details | Query                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Results | Time     |
|--------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|
| #2     | ...     | ⓘ       | <p>Search: <b>how do i manage a patient with trauma?</b></p> <p><b>manage a</b>[Author] AND ("patient s"[All Fields] OR "patients"[MeSH Terms] OR "patients"[All Fields] OR "patient"[All Fields] OR "patients s"[All Fields]) AND ("injuries"[MeSH Subheading] OR "injuries"[All Fields] OR "trauma"[All Fields] OR "wounds and injuries"[MeSH Terms] OR ("wounds"[All Fields] AND "injuries"[All Fields]) OR "wounds and injuries"[All Fields] OR "trauma s"[All Fields] OR "traumas"[All Fields])</p> <p><b>Translations</b></p> <p><b>manage a:</b> manage a[Author]</p> <p><b>patient:</b> "patient's"[All Fields] OR "patients"[MeSH Terms] OR "patients"[All Fields] OR "patient"[All Fields] OR "patients's"[All Fields]</p> <p><b>trauma:</b> "injuries"[Subheading] OR "injuries"[All Fields] OR "trauma"[All Fields] OR "wounds and injuries"[MeSH Terms] OR ("wounds"[All Fields] AND "injuries"[All Fields]) OR "wounds and injuries"[All Fields] OR "trauma's"[All Fields] OR "traumas"[All Fields]</p> <p><b>Warnings</b></p> <p><b>how do i</b> manage a patient <b>with</b> trauma?</p> <p><b>Stop words:</b> how, do, i, with</p> | 0       | 09:15:56 |

PubMed guessed at what you meant and guessed wrong. It thought "manage a" was an author because that's how author searches are formatted: last name, then first initial. This means it mangled your search without you even knowing! We will avoid all that by learning to speak to the database in its language.

You can repeat these steps and check the interpretation of any search by clicking Advanced after searching in PubMed, scrolling to History and Search Details, and clicking the caret under Details to expand.

PubMed's guessing process is called "mapping." That's why it's essential to learn the language of PubMed so you can avoid incorrect mapping.

We won't cover every technical trick you can perform in a database; otherwise, this course will never end! Instead, you'll learn the basics of creating a high-quality search

with minimal bias that doesn't miss important papers.

## What is Medline? What is PubMed?

A **database** is a collection of journal articles. A **platform** is the online tool used to search that collection. [Review standards require you to list the database and platform](#) for transparency and replicability.

Medline is a database that can be searched through three different platforms: PubMed, Ovid, and EBSCO. **You only need to include one of these.** We will be choosing **PubMed**.

Think of Ovid Medline, Medline Complete (EBSCO's Medline product), and PubMed as triplets. However, only PubMed is famous, and Ovid Medline and Medline Complete are constantly getting mistaken for their more famous sibling.

## Standards We'll Be Following

The literature search will need to be conducted according to [Peer Review Electronic Search Strategies guidelines](#). Use the checklist in Table 1.

## What About Limits?

Limits or filters are ways of narrowing the search and eliminating unwanted papers. They can include dates, languages, species, ages, countries, types of studies, etc. A couple of essential points:

- **Don't limit unless you must.** Using any limit brings the risk of missing relevant papers. For example, a United States limit eliminates a paper whose only location indicator is Geisinger Medical Center in Pennsylvania.
- **Every limit requires justification.** Peer reviewers will ask you for the reasoning behind any limit and can reject your paper if they deem your reasoning insufficient. An example of proper justification: you could use a date limit starting when an intervention was introduced.
- **Don't limit to English** due to [language bias](#). Many journals will reject your paper if they see that you're limited to English. You can use English language in your screening criteria. If you have multilingual team members, consider screening papers in other languages. You can also have a volunteer translate the paper using [Cochrane Engage](#). Select "Translation (linguistic)" for your task.
- **Don't use the built-in filters found in databases.** Instead, use one that is validated and tested for sensitivity and specificity and cite its creator. Below are acceptable places to find limits:
  - [LSSR](#)
  - [InterTASC](#)

- [CADTH](#)

Limiting to humans is not recommended as it will eliminate relevant papers, especially since humans is the most forgotten identifier. If you do limit, use the double NOT method shown [on this page](#).

**Limits are not a shortcut to fixing a question bringing back too many results.** Fix your question and your search first, then explore using limits. **Avoid using NOT**, as it frequently removes relevant papers.

## STEPS FOR CREATING YOUR SEARCH

### What You'll Need

You'll need a text editor (Microsoft Word, Notepad, etc.) and an internet browser for the following steps. Turning off autocorrect is recommended. You'll be typing code the program won't recognize and may try to change. Or record your search in a .txt file (using a program like TextEdit or Notepad), which is less likely to autocorrect your work.

### **Breaking Your Question into Concepts**

Break your research question into **concepts**. Start by making each letter of your question development framework (PICO or PCC) a concept. To broaden a question, remove a concept. To narrow it, add one or more concepts.

Don't include every piece of inclusion criteria as a concept. You can't expect the search to do the screening for you. We are also trying to cast as broad a net as possible to avoid missing papers.

Put each concept of your question into a table row, adding rows if needed. Don't mix concepts within lines, as that will require extra coding. Leave the last line blank. That's where we'll combine all of our concepts.

"How does social isolation affect HIV patients' quality of life?" turns into:

|   |                  |
|---|------------------|
| 1 | HIV              |
| 2 | social isolation |
| 3 | quality of life  |
| 4 |                  |

### Create Keywords

For each search concept, come up with a list of synonyms. These are called **keywords** and include:

- Synonyms
- Alternate spellings, such as British spellings
- Alternate endings of words, such as plural endings
- Abbreviations
- Acronyms
- Medical terminology
- Laymen's terms

This is where you could use AI to generate a list as you brainstorm. Just ask it: "What are other ways of saying \_\_\_\_?" and spot check what it produces.

### **Dos and Don'ts of Keywords**

- ***Don't be redundant***

For example, including both preeclampsia and pregnancy as concepts is unnecessary. Similarly, you wouldn't need both Lichtenstein therapy and inguinal hernias. The treatment is for inguinal hernias, so pick just one.

Don't be redundant with phrases, either. If you use recovery as a keyword, that will pick up papers with the phrases mental health recovery, addiction recovery, recovery from surgery, and so on. You do not need to list out every phrase that word appears in.

However, if you search for mental recovery, it will not pick up mental health recovery. The database looks for words in the order in which you have listed them.

- ***Don't use excessively broad words.***

Using a word in your search that has other meanings or contexts is going to lead to tons of **false positives** or false hits. In other words, unrelated papers will start to flood your results.

For example, using "recovery" in a search on mental health could bring back papers on surgery recovery. You could specify those words to mental health recovery, addiction recovery, etc.

- ***Do be careful with acronyms.***

Some acronyms have more than one meaning (MS, for example). This is especially common with short, two-letter acronyms. Follow the same tips as before – specify if possible or weed out during screening.

- ***Do include both the acronym or abbreviation and the complete word spelled out.***
- ***Don't be stingy with keywords.***

We're trying to think of ways different authors would describe each word. If you are too limited in your list, you'll miss papers.

- **Do experiment with the order of words.**

Try to think of all the variations for keywords that differ in word order, such as video game addiction or addiction to video games, e.g.,

Here's our example search with keywords:

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | human immunodeficiency virus<br>human immunodeficiency viruses<br>HIV<br>AIDS virus<br>AIDS viruses<br>acquired immune deficiency syndrome virus<br>acquired immune deficiency syndrome viruses<br>acquired immunodeficiency syndrome virus<br>acquired immunodeficiency syndrome viruses<br>Human T Cell Lymphotropic Virus Type III<br>Human T Cell Leukemia Virus Type III<br>HTLV III<br>Human T Lymphotropic Virus Type III<br>Lymphadenopathy Associated Virus<br>Lymphadenopathy Associated Viruses<br>PLWHA<br>PWH |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|   |                                                                                                                                                                                                      |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 | social disconnection<br>socially disconnected<br>disconnected socially<br>social deprivation<br>loneliness<br>lonesome<br>lonely<br>feeling alone<br>social isolation<br>friendless<br>companionless |
| 3 | quality of life<br>QOL<br>HRQOL<br>life quality                                                                                                                                                      |
| 4 |                                                                                                                                                                                                      |

## Words and Characters That Will Break Your Search

Some words and characters will cause your search to break, meaning you'll receive an error message, or your search will not run as intended. Remove these from your search or put the offending word or character in quotes.

- **Stop words**

Stopwords are words in databases that will either be ignored, misinterpreted, or cause your search to "break," meaning you'll see an error message and the search won't be processed. It's critical to delete these words from your search to ensure the search is going through as you expect, and so that relevant papers on your topic are retrieved.

Here's a [complete list of stop words](#).

- **Special characters**
- **Numbers**

Numbers are used as a shorthand way to reference lines. For example, #1 AND #2 AND #3 will combine everything within the search lines 1-3. You must put a number in a keyword within quotes, or the database will think you are referring to that search line.

Below are examples of how to handle stop words. Also, straight quotes are processed more effectively than curly quotes:

"equity and inclusion"  
equity inclusion  
equity "and" inclusion

### **Truncate Appropriate Keywords**

**Truncation** is used to pick up different iterations of words, making your search more exhaustive. Truncation symbols can stand for one character or multiple characters, but we'll keep it simple and focus on the asterisk, which picks up various characters.

To truncate, add the correct symbol to the word's stem -- not the entire word. Delete any keyword that you know will be picked up by the truncation.

#### **An asterisk finds multiple characters at the end of a word:**

anesthese\* finds anesthesia, anesthetic, anesthetics, anesthetist, anesthetists, anesthesiologist, anesthesiologists, anesthesiologist's, anesthesiologists'

Be careful with truncation picking up unintended words. For example, if your search is on hip surgery, don't use hip\* because it will pick up hippo and hippos. Instead, spell out hips OR hip.

PubMed will not understand a phrase with both words truncated. In other words, cognit\* declin\* would not be readable in PubMed. PubMed will only understand it if the last word of the phrase is truncated like so:

cognitive declin\*

PubMed also requires that you put at least four letters before the asterisk. This means edu\* is not readable and will be ignored.

### **Add Quotation Marks If Needed**

Adding quotation marks around a phrase will ensure the words are found in that exact order and phrasing.

### **Add Operators**

We'll now add "or" and "and" back into the search. Except this time, they won't be stop words. Instead, they will serve as commands. Their technical name is **operators**.

For each concept, connect the list of synonyms with OR. Capitalize OR so you can differentiate between keywords and operators. Connect the concepts in the last line with AND. Refer to each concept by the number next to it.

Check out our search that now has both truncation and operators:

|   |                                                                                                                                                                                                                                                                                                                                            |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | human immunodeficiency virus* OR HIV OR AIDS virus* OR acquired immune deficiency syndrome virus* OR acquired immunodeficiency syndrome virus* OR Human T Cell Lymphotropic Virus Type III OR Human T Cell Leukemia Virus Type III OR HTLV III OR Human T Lymphotropic Virus Type III OR Lymphadenopathy Associated Virus* OR PLWHA OR PWH |
| 2 | social disconnect* OR disconnected social* OR social deprivation OR loneliness OR lonesome OR lonely OR feeling alone OR social isolat* OR socially isolated OR friendless OR companionless                                                                                                                                                |
| 3 | quality of life OR QOL OR HRQOL OR life quality                                                                                                                                                                                                                                                                                            |
| 4 | #1 AND #2 AND #3                                                                                                                                                                                                                                                                                                                           |

### **Add Field Tags to Keywords**

You need to tell the database *where* to look for your keyword. To do this, we'll add field tags. "Field tag" refers to where the database looks for your word: in author field, title field, abstract field, etc.

Applying field tags almost always turns off the mapping feature that we discussed at the start of the lesson. But, sometimes it doesn't so make sure to always check the search details in Advanced to make sure nothing has gone awry. If you do see strange mapping, you can put the offending terms in quotes which will prevent it from being mapped.

Field tags use abbreviations. Just as a doctor might write "pt" to indicate patient, a database will use "ti" to indicate title. Below are some standard abbreviations you'll see in field tags:

|                   |      |
|-------------------|------|
| Title             | ti   |
| Title or abstract | tiab |

The field tag we'll be using is:

[tiab]

This searches within each paper's **title** and **abstract**. You'll need to add a tag to every keyword like so:

social exclusion[tiab] OR social isolation[tiab]

Here is our search with field tags:

|   |                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | human immunodeficiency virus*[tiab] OR HIV[tiab] OR AIDS virus*[tiab] OR acquired immune deficiency syndrome virus*[tiab] OR acquired immunodeficiency syndrome virus*[tiab] OR Human T Cell Lymphotropic Virus Type III[tiab] OR Human T Cell Leukemia Virus Type III[tiab] OR HTLV III[tiab] OR Human T Lymphotropic Virus Type III[tiab] OR Lymphadenopathy Associated Virus*[tiab] OR PLWHA[tiab] OR PWH[tiab] |
| 2 | social disconnect*[tiab] OR disconnected social*[tiab] OR social deprivation[tiab] OR loneliness[tiab] OR lonesome[tiab] OR lonely[tiab] OR feeling alone[tiab] OR social isolat*[tiab] OR socially isolated[tiab] OR friendless[tiab] OR companionless[tiab]                                                                                                                                                      |
| 3 | quality of life[tiab] OR QOL[tiab] OR HRQOL[tiab] OR life quality[tiab]                                                                                                                                                                                                                                                                                                                                            |
| 4 | #1 AND #2 AND #3                                                                                                                                                                                                                                                                                                                                                                                                   |

### **Add Subject Headings**

**Controlled vocabulary** or **subject headings** are a tagging method used by many databases. Just as social media posts are tagged with hashtags, databases tag journal articles with relevant subject headings.

You must include subject headings and keywords for your search to be comprehensive and follow PRESS standards.

[Here is the link to the MeSH thesaurus](#) that we'll be using. Some rules about subject headings:

- They differ by database
- Some databases have proprietary names for subject headings. Medline calls theirs MeSH (Medical Subject Headings), and Embase calls theirs Emtree terms.
- Every database with subject headings has a thesaurus
- Subject headings are a fixed list. You can't put any word you'd like as a subject heading
- For subject headings concerning marginalized populations, [read this article](#)

For every concept, you'll need to look up each key term within the MeSH thesaurus to see if there is an equivalent subject heading. Sometimes, the word is not what you expect it to be. For example, cancer is called "neoplasms" in MeSH.

## Explosion

For each subject heading you include, you must decide whether or not to **explode** it. Subject headings work within a **hierarchy**: broader terms above and narrower terms below. **Explosion** refers to whether all narrower terms are included.

- An **exploded** subject heading includes all nested terms beneath it. Here's how to format that:

"Subject Heading"[Mesh]

If you click the "Add to search builder" button on the MeSH term's page (on the right), it will format it for you.

- A subject heading that is **not exploded** does not include nested terms. To format that, put Majr in place of Mesh:

"Subject Heading"[Majr]

This formatting is not case-sensitive. You can capitalize or uncapitalize any of these words.

Why does explosion matter? Let's look at the subject heading for "epidemics" to be used in a project on COVID-19. Can you spot the problem?

## Epidemics

Sudden outbreaks of a disease in a country or region not previously recognized in that area, or a rapid increase in the number of new cases of a previous existing endemic disease. Epidemics can also refer to outbreaks of disease in animal or plant populations.

Year introduced: 2011

PubMed search builder options

[Subheadings:](#)

☐ classification

☐ economics

☐ ethics

☐ history

☐ legislation and jurisprudence

☐ prevention and control

☐ psychology

☐ statistics and numerical data

☐ veterinary

☐ Restrict to MeSH Major Topic.

☐ Do not include MeSH terms found below this term in the MeSH hierarchy.

Tree Number(s): N06.850.290.200

MeSH Unique ID: D058872

Previous Indexing:

- [Disease Outbreaks \(1966-2010\)](#)

[All MeSH Categories](#)

[Health Care Category](#)

[Environment and Public Health](#)

[Public Health](#)

[Disease Outbreaks](#)

**Epidemics**

[Opioid Epidemic](#)

[Pandemics](#)

The issue is the nested term "opioid epidemic." We don't want that included in our search, or we will get back unrelated papers. So, what do we do? To solve this issue, format the search like this:

"Epidemics"[Majr] OR "Pandemics"[MeSH]

Back to our example, we'll now take the subject headings and connect them to the proper line using OR:

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | human immunodeficiency virus*[tiab] OR HIV[tiab] OR AIDS virus*[tiab] OR acquired immune deficiency syndrome virus*[tiab] OR acquired immunodeficiency syndrome virus*[tiab] OR Human T Cell Lymphotropic Virus Type III[tiab] OR Human T Cell Leukemia Virus Type III[tiab] OR HTLV III[tiab] OR Human T Lymphotropic Virus Type III[tiab] OR Lymphadenopathy Associated Virus*[tiab] OR PLWHA[tiab] OR PWH[tiab] OR "HIV"[MeSH] OR "HIV Infections"[MeSH] |
| 2 | social disconnect*[tiab] OR disconnected social*[tiab] OR social deprivation[tiab] OR loneliness[tiab] OR lonesome[tiab] OR lonely[tiab] OR feeling alone[tiab] OR social isolat*[tiab] OR socially isolated[tiab] OR friendless[tiab] OR companionless[tiab] OR "Loneliness"[MeSH] OR "Social                                                                                                                                                              |

|   |                                                                                                    |
|---|----------------------------------------------------------------------------------------------------|
|   | Isolation"[MeSH] OR "Social Deprivation"[MeSH]                                                     |
| 3 | quality of life[tiab] OR QOL[tiab] OR HRQOL[tiab] OR life quality[tiab] OR "Quality of Life"[MeSH] |
| 4 | #1 AND #2 AND #3                                                                                   |

## Entry Terms

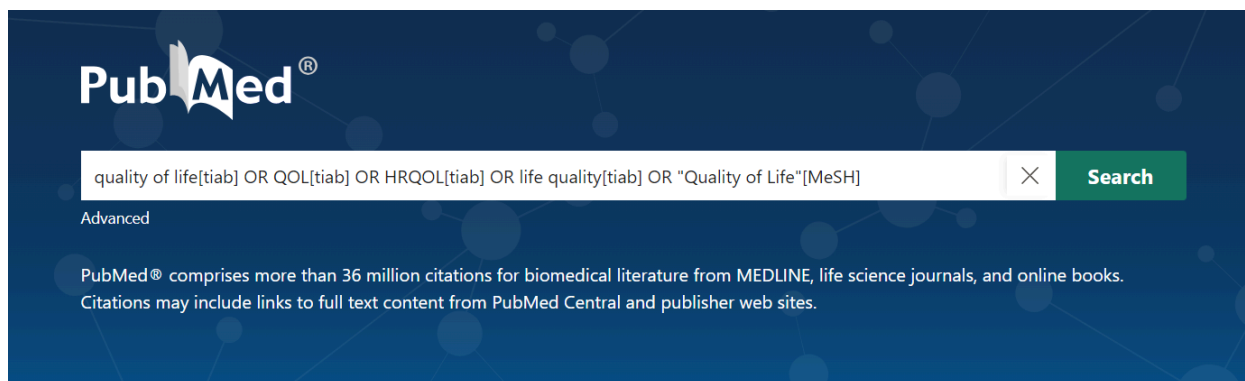
You'll see a list of words called [entry terms](#) in nearly every MeSH record. They are synonyms and other closely related terms for a MeSH term. Check them to see if you forgot any synonyms, and add them as keywords to your search.

You aren't obligated to add an entry term as a keyword if it's unrelated—for example, the loneliness subject heading lists "homesickness" as an entry term. We won't add that because it's irrelevant to our question.

## Execute the Search

### Begin Your Search

We are now ready to take this search into [PubMed](#). Copy and paste each search line into the box and click Search. For the example search, you'll perform three searches in a row.



**PubMed®**

quality of life[tiab] OR QOL[tiab] OR HRQOL[tiab] OR life quality[tiab] OR "Quality of Life"[MeSH] × **Search**

Advanced

PubMed® comprises more than 36 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full text content from PubMed Central and publisher web sites.

Once you're done with all of the searches, click "Advanced" under the search bar:

×

Search

[Advanced](#)
[Create alert](#)
[Create RSS](#)
[User Guide](#)

Scroll to "History and Search Details." Look out for any red exclamation marks. If you see anything, click the greater than symbol under Details to see what went wrong. There is one exception to the warnings. If you see "Quoted phrases not found in phrase index," that's fine. It just means your keyword wasn't found in any papers.

Make a note of what number has been assigned for each line. For example, the HIV concept can be referred to as #1. Next, connect all of the concepts. You'll be writing this out as a separate search. For our search, we'll write #1 AND #2 AND #3 and then hit search:

History and Search Details

Download

Delete

| Search | Actions | Details | Query                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Results | Time     |
|--------|---------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|
| #4     | ...     | >       | Search: #1 AND #2 AND #3                                                                                                                                                                                                                                                                                                                                                                                                                                            | 119     | 17:28:41 |
| #3     | ...     | >       | Search: quality of life[tiab] OR QOL[tiab] OR HRQOL[tiab] OR life quality[tiab] OR "Quality of Life"[MeSH]                                                                                                                                                                                                                                                                                                                                                          | 464,724 | 17:20:58 |
| #2     | ...     | >       | Search: social disconnect*[tiab] OR disconnected social*[tiab] OR social deprivation[tiab] OR loneliness[tiab] OR lonesome[tiab] OR lonely[tiab] OR feeling alone[tiab] OR social isolat*[tiab] OR socially isolated[tiab] OR friendless[tiab] OR companionless[tiab] OR "Loneliness"[MeSH] OR "Social Isolation"[MeSH] OR "Social Deprivation"[MeSH]                                                                                                               | 55,863  | 17:20:53 |
| #1     | ...     | >       | Search: human immunodeficiency virus*[tiab] OR HIV[tiab] OR AIDS virus*[tiab] OR acquired immune deficiency syndrome virus*[tiab] OR acquired immunodeficiency syndrome virus*[tiab] OR Human T Cell Lymphotropic Virus Type III[tiab] OR Human T Cell Leukemia Virus Type III[tiab] OR HTLV III[tiab] OR Human T Lymphotropic Virus Type III[tiab] OR Lymphadenopathy Associated Virus*[tiab] OR PLWHA[tiab] OR PWH[tiab] OR "HIV"[MeSH] OR "HIV Infections"[MeSH] | 458,487 | 17:20:46 |

Showing 1 to 4 of 4 entries

You must use a hashtag or number sign in front of each number. This means 1 and 2 and 3 will *not* work to combine your searches. You should be sent directly to your results, or click the number of results (91 in this case) to view them.

## Assessing the Search

Once you're done searching, take a look at the results and think critically. Ask yourself:

- Do the results seem relevant? There will always be some off-topic papers, but

you will want to see on-topic items.

- Are you seeing off-topic words repeated? Can you trace the issue back to the use of truncation or keywords?
- How many results are you getting back?

**The number of results is not the final number.** The final number of deduplicated results across the core databases will be roughly **triple or 3.5 times** the number in PubMed.

If the number seems **low (<200 in PubMed generally)**, there are ways to broaden the search:

- Add more truncation
- Add more synonyms
- Add more subject headings
- Consider exploding subject headings

If the number seems **high (>3,000 in PubMed generally)**, there are ways to focus the search:

- Check your explosions for irrelevant terms
- Check for unnecessarily broad keywords or acronyms
- Check that truncation isn't pulling in irrelevant terms
- Add a concept to your research question

Avoid overly manipulating the search to reduce the number simply because you and your team don't want to screen many papers. The results serve as part of the answer to your question. Namely, how much has been written on this topic? But if too much is coming back, it is perfectly acceptable to revise your question.

There's no perfect number of results for a review, but there are definitely bad numbers. If you've searched across all the databases and are looking at a number close to 10,000 after removing duplicates, it's a lot less likely you're going to finish your project. That said, I have seen teams make it over the finish line with those types of numbers. You just need a really robust and strong team. On the opposite end of the spectrum, very few searches should be netting under 1,000 papers. That only happens in extreme circumstances when the topic is very narrow. Too few papers means you definitely missed papers and points to a poor quality search.

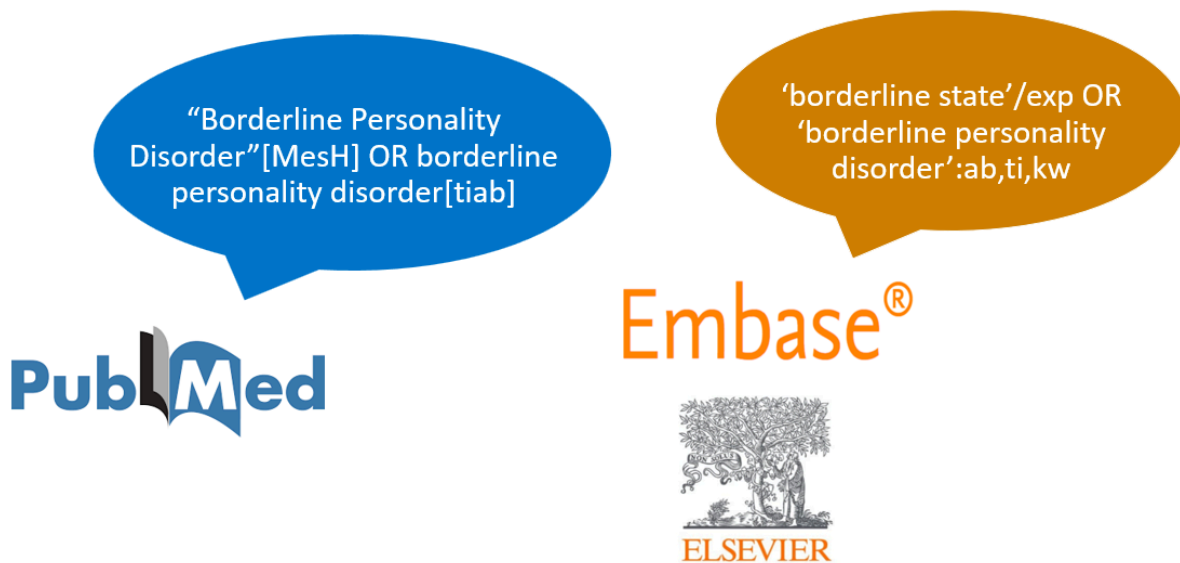
Once you've refined the search and made any changes, you're ready to move on to the next step. You also now have a search that's ready for translation!

## Lesson 6: Translation Overview and Core List of Databases

### What is Translation?

In these next lessons, we'll take the Medline search you created and make it readable in other databases. This process is called **translation**. Each database has its own language, which means you cannot use the search you created in the last lesson for any other database. If you do, you'll either see an error message or the search won't run properly, invalidating the findings of your review.

If you were to copy and paste your PubMed search directly into Embase, [this is what it would sound like](#) to Embase. It might be able to pick out some words and general ideas, but otherwise, it has no idea what you're saying and what you want.



We can't cover translation to every medical database in existence. Otherwise, this course would never end! Instead, we'll learn how to translate the search to the core databases any comprehensive review project should include.

### Minimum List of Databases

Remember, you can't just use PubMed for your paper because PubMed, while it contains many papers, doesn't have every paper. Also, don't haphazardly pick databases. Instead, use our recommendations guided by research on optimal database combinations (see below).

Think of your search like a stock portfolio; it needs to be **diversified**. If your portfolio has just Apple, Microsoft, and QQQ in it, that's a bad portfolio. You need to own stocks in a variety of industries and sectors because if, for example, there's an 100% tariff on semiconductors, you've just lost all your money.

Same idea with your search. Don't put all of your eggs in the PubMed basket. Include a diversified set of databases. In fact, people have studied and published [research](#) on the best databases to use. Based on that research, here are the core databases we recommend:

1. **Medline**
2. **Embase**
3. **Cochrane CENTRAL**
4. **Web of Science\***

*\*If you are conducting a rapid review, you can skip this database*

## **Dos and Don'ts**

- Do add subject-specific databases like PsycINFO, CINAHL, etc., if relevant to your topic. We won't cover subject-specific databases in this course.
- Do include some grey literature sources.
- Do search each database one at a time.
- Don't use an aggregate search engine like OneSearch or HOLLIS.
- Do be careful with products like Open Evidence. **These are not databases.** They are chatbots, like ChatGPT. They're fine to search as a supplement. For example, you can upload your protocol and ask the tool to produce a list of PMIDs for you based on that protocol, separated out by OR so you can feed that list into PubMed. But don't rely on chatbots for the heavy lifting of the search. Their purpose is to catch stray papers that are weirdly indexed.

## **What about Grey Literature?**

Grey literature (typically spelled the British way) refers to unpublished materials that have not gone through peer review. While that may sound suspect, be assured that these materials play an important role in the review process.

Searching grey literature improves publication bias in your paper. Publication bias is the phenomenon where papers with positive results are more likely to be published than those with negative or null results. This means including grey literature in a review has a [profound effect on its results](#). Also, it's expected by major standards that you include at least some unpublished literature in your search to mitigate publication bias (see the [Institute of Medicine's systematic review standards](#) 3.2.1).

Your search will automatically include a little bit of grey literature (by way of conference abstracts) using the core databases. If you want to add more grey literature to your search, check out my [Big Book of Grey Literature](#). If you use any of these, be sure to add them to your methods section. You can preface these sources by saying, "Searches for grey literature were conducted using the following sources... [list the sources you used]."

You obviously don't need to include every type of grey literature. Just pick and choose based on what makes sense. For example, dissertations are often good for scoping review questions, but don't make much sense for standard interventional systematic review questions.

## Before We Begin

Your keywords will stay the same as you translate, and the subject headings (assuming the database you're translating to uses them) will change.

Create a Word document or Google doc for each database and save it as the name of the database you're translating to. Then, when you're finished, fill out the blank appendix (listed as a resource for this lesson) so you can record all of the translations. In each document, it's easiest to use the **find and replace feature** in whatever text editor you use to make these changes.

Once finished, your appendix should look something like this:

## Appendix 1

Supplemental Table 1, Full Search Strategy for Ovid MEDLINE and Cochrane CENTRAL

|    |                                                                                                                                                                                                                   |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1 | Uterus/ OR exp Endometrium/ OR Myometrium/                                                                                                                                                                        |
| #2 | exp Organ Preservation/ OR Cryopreservation/                                                                                                                                                                      |
| #3 | 1 and 2                                                                                                                                                                                                           |
| #4 | (uteri OR womb? OR uterus OR uterifor OR endometrium or endometrial epithelium or endometria OR myometrium).ti,ab,kf. adj3 (perfus* OR preserv* OR cryopreserv* OR cold storage OR cryonic suspension?).ti,ab,kf. |
| #5 | 4 or 5                                                                                                                                                                                                            |

Supplemental Table 2, Full Search Strategy for Embase.com

|    |                                                                                                                                                                                                                  |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1 | 'uterus'/de OR 'myometrium'/exp OR 'endometrium'/de OR 'uterus cavity'/exp OR 'uterine fundus'/exp OR 'ectopic endometrium'/exp OR 'eutopic endometrium'/exp                                                     |
| #2 | 'cryopreservation'/exp OR 'organ perfusion'/exp OR 'organ preservation'/exp                                                                                                                                      |
| #3 | ((uteri OR womb? OR uterus OR uterifor OR endometrium or 'endometrial epithelium' or endometria OR myometrium) NEAR/3 (perfus* OR preserv* OR cryopreserv* OR 'cold storage' OR 'cryonic suspension?')):ab,ti,kw |
| #4 | #1 AND #2                                                                                                                                                                                                        |
| #5 | #3 OR #4                                                                                                                                                                                                         |

Supplemental Table 3, Full Search Strategy for Web of Science

|    |                                                                                                                                                                                                                                                                                                                                     |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1 | TS=(perfus* NEAR/3 uteri) OR TS=(perfus* NEAR/3 womb?) OR TS=(perfus* NEAR/3 uterus) OR TS=(perfus* NEAR/3 uterifor) OR TS=(perfus* NEAR/3 endometrium) OR TS=(perfus* NEAR/3 "endometrial epithelium") OR TS=(perfus* NEAR/3 endometria) OR TS=(perfus* NEAR/3 myometrium)                                                         |
| #2 | TS=(preserv* NEAR/3 uteri) OR TS=(preserv* NEAR/3 womb?) OR TS=(preserv* NEAR/3 uterus) OR TS=(preserv* NEAR/3 uterifor) OR TS=(preserv* NEAR/3 endometrium) OR TS=(preserv* NEAR/3 "endometrial epithelium") OR TS=(preserv* NEAR/3 endometria) OR TS=(preserv* NEAR/3 myometrium)                                                 |
| #3 | TS=(cryopreserv* NEAR/3 uteri) OR TS=(cryopreserv* NEAR/3 womb?) OR TS=(cryopreserv* NEAR/3 uterus) OR TS=(cryopreserv* NEAR/3 uterifor) OR TS=(cryopreserv* NEAR/3 endometrium) OR TS=(cryopreserv* NEAR/3 "endometrial epithelium") OR TS=(cryopreserv* NEAR/3 endometria) OR TS=(cryopreserv* NEAR/3 myometrium)                 |
| #4 | TS=("cold storage" NEAR/3 uteri) OR TS=("cold storage" NEAR/3 womb?) OR TS=("cold storage" NEAR/3 uterus) OR TS=("cold storage" NEAR/3 uterifor) OR TS=("cold storage" NEAR/3 endometrium) OR TS=("cold storage" NEAR/3 "endometrial epithelium") OR TS=("cold storage" NEAR/3 endometria) OR TS=("cold storage" NEAR/3 myometrium) |
| #5 | TS=("cryonic suspension" NEAR/3 uteri) OR TS=("cryonic suspension" NEAR/3 womb) OR TS=("cryonic suspension" NEAR/3 uterus) OR TS=("cryonic suspension" NEAR/3 uterifor) OR TS=("cryonic suspension" NEAR/3 endometrium) OR TS=("cryonic                                                                                             |

|    |                                                                                                                                            |
|----|--------------------------------------------------------------------------------------------------------------------------------------------|
|    | suspension" NEAR/3 "endometrial epithelium") OR TS=("cryonic suspension" NEAR/3 endometria) OR TS=("cryonic suspension" NEAR/3 myometrium) |
| #6 | #1 OR #2 OR #3 OR #4 OR #5                                                                                                                 |

Supplemental Table 4, Full Search Strategy for Cochrane CDSR

|    |                                                                                                                                                                                                                   |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1 | (uteri OR womb? OR uterus OR uterifor OR endometrium or endometrial epithelium or endometria OR myometrium).ti,ab,kw. adj3 (perfus* OR preserv* OR cryopreserv* OR cold storage OR cryonic suspension?).ti,ab,kw. |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Searching involves troubleshooting and editing. As you translate, you may end up editing your Medline search (for example, if you see a subject heading in Embase that inspires you to add a keyword to your search). But remember: **if you change something in one search, you must change all the database searches to match.**

This is another moment where you could use AI, but not to translate an entire search. For example, don't ask the tool to translate your search for you because it will make up subject headings. Instead, use it for formatting and ask it for specific things like: "Can you put this list of words into single quotes?" which will help you during Embase translation.

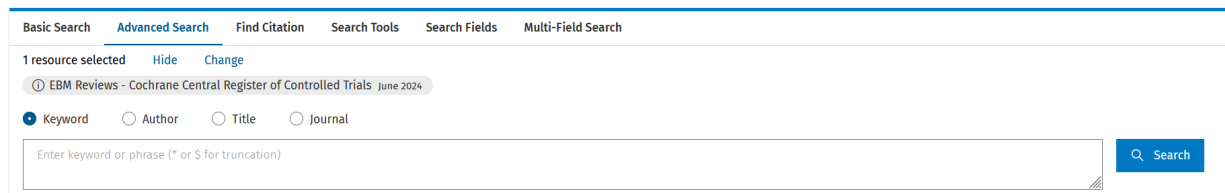
## Lesson 7: Translate to Cochrane

Cochrane Library offers a number of databases but the one we'll be using is called Cochrane Central Register of Controlled Trials (CENTRAL). We'll be accessing this database using the Ovid platform. Note this is a subscription platform so do make sure your library has access to it. If you are an MGB employee, you can access it through the [MGB Handbook](#). Another option is search Cochrane CENTRAL through [Cochrane's website here](#).

First, get into Ovid then to select **EBM Reviews - Cochrane Central Register of Controlled Trials** from the "Select Resource(s) to search" pop-up window.

### Translating to Cochrane CENTRAL

Make sure the database you're searching in is **EBM Reviews - Cochrane Central Register of Controlled Trials**:



The screenshot shows the Ovid search interface. At the top, there are tabs for 'Basic Search', 'Advanced Search', 'Find Citation', 'Search Tools', 'Search Fields', and 'Multi-Field Search'. Below these, it says '1 resource selected' with 'Hide' and 'Change' links. A dropdown menu shows 'EBM Reviews - Cochrane Central Register of Controlled Trials' with a date 'June 2024'. Below this, there are radio buttons for 'Keyword' (selected), 'Author', 'Title', and 'Journal'. A search input field contains the placeholder text 'Enter keyword or phrase (\* or \$ for truncation)'. To the right of the input field is a blue 'Search' button.

Go back to your PubMed search and make the following changes:

- Change every [tiab] to .ti,ab,kf
- If you have the word "use" as a part of your keywords (substance use disorder, e.g.), put it into quotes! Use is a command in the Ovid platform
- Remove hashtags or number symbols: #1 AND #2 AND #3 turns into 1 and 2 and 3
- Change the formatting of all MeSH terms. The MeSH term itself will not need to be changed.

|                                | PubMed            | Cochrane CENTRAL |
|--------------------------------|-------------------|------------------|
| Exploded MeSH term             | "Pandemics"[MeSH] | exp Pandemics/   |
| MeSH term that is not exploded | "Pandemics"[Majr] | Pandemics/       |

Copy and paste each line into the search field, one by one. As a last step, copy and paste your AND's (1 and 2 and 3).

You may notice Ovid starts to combine your keywords (this OR that).ti,ab,kf. Or you may notice that Ovid has put a period after your ti,ab,kf. Don't worry! That's all perfectly fine.

Your search is still running properly.

As an example, here's our PubMed search translated:

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | human immunodeficiency virus*.ti,ab,kf OR HIV.ti,ab,kf OR AIDS virus*.ti,ab,kf OR acquired immune deficiency syndrome virus*.ti,ab,kf OR acquired immunodeficiency syndrome virus*.ti,ab,kf OR Human T Cell Lymphotropic Virus Type III.ti,ab,kf OR Human T Cell Leukemia Virus Type III.ti,ab,kf OR HTLV III.ti,ab,kf OR Human T Lymphotropic Virus Type III.ti,ab,kf OR Lymphadenopathy Associated Virus*.ti,ab,kf OR PLWHA.ti,ab,kf OR PWH.ti,ab,kf OR exp HIV/ OR exp HIV Infections/ |
| 2 | social disconnect*.ti,ab,kf OR disconnected social*.ti,ab,kf OR social deprivation.ti,ab,kf OR loneliness.ti,ab,kf OR lonesome.ti,ab,kf OR lonely.ti,ab,kf OR feeling alone.ti,ab,kf OR social isolat*.ti,ab,kf OR socially isolated.ti,ab,kf OR friendless.ti,ab,kf OR companionless.ti,ab,kf OR exp Loneliness/ OR exp Social Isolation/ OR exp Social Deprivation/                                                                                                                     |
| 3 | quality of life.ti,ab,kf OR QOL.ti,ab,kf OR HRQOL.ti,ab,kf OR life quality.ti,ab,kf OR exp Quality of Life/                                                                                                                                                                                                                                                                                                                                                                               |
| 4 | 1 AND 2 AND 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## Lesson 8: Translate to Web of Science

**Note:** If you are conducting a rapid review, you can skip this lesson.

### Getting Started

Web of Science is a subscription platform. Check with your library to see if they have access, or if they have access to Scopus, which will work as a replacement. MGB employees can access [Web of Science via HMS](#). If you don't have a Harvard Key, any MGB physician can sponsor you for a library [proxy account](#).

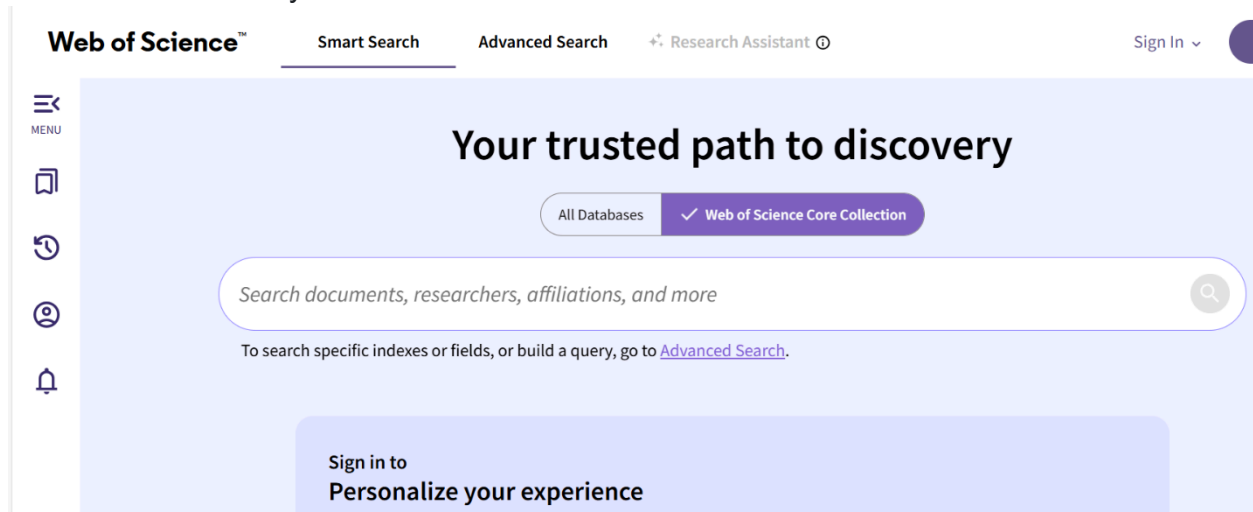
Web of Science *does not* use subject headings. It's easiest to take your Cochrane formatted search and edit it further. Within your Word document, make the following changes:

- Delete all subject headings
- If you have the word "near" as a keyword, put it in quotes (NEAR is a command!)
- Remove all field tags (.ti,ab,kw) and parentheses
- Change all question marks to asterisks or dollar signs

You can again use an AI tool here safely. Just like the Embase lesson, tell the tool you're going to give it a block of text, to ignore the word "or" and give it a specific thing to do (put these words in double quotes, e.g.). Word's "find and replace" tool is also quite handy here.

### Using Advanced Search

Click the link that says **Advanced Search** under the search bar:



You'll then see this screen:

Web of Science™

Smart Search

Advanced Search

Research Assistant ⓘ

MENU

DOCUMENTS

RESEARCHERS

Search in: Web of Science Core Collection ▾ Editions: All ▾

FIELD SEARCH

QUERY BUILDER

CITED REFERENCES

STRUCTURE

Topic ▾

Example: oil spill\* mediterranean

+ Add row

+ Add date range

×

Clear

Copy and paste the terms for your first concept from your Word document into the search bar:

DOCUMENTS

RESEARCHERS

Search in: Web of Science Core Collection ▾ Editions: All ▾

FIELD SEARCH

QUERY BUILDER

CITED REFERENCES

STRUCTURE

Topic ▾

Example: oil spill\* mediterranean  
human immunodeficiency virus\* OR HIV OR AIDS virus\* OR acquired immune deficiency sy

+ Add row

+ Add date range

×

Clear

🔍

Search

Once you're finished, click Add row to add in the next set of terms. Do this as many times as you need to:

DOCUMENTS

RESEARCHERS

Search in: Web of Science Core Collection ▾ Editions: All ▾

FIELDED SEARCH

QUERY BUILDER

CITED REFERENCES

STRUCTURE

Topic ▾

Example: oil spill\* mediterranean  
human immunodeficiency virus\* OR HIV OR AIDS virus\* OR acquired immune deficiency sy X

⊖ And ▾

All Fields ▾

Example: liver disease india singh  
social disconnect\* OR disconnected social\* OR social deprivation OR loneliness OR lonesc X

+ Add row

+ Add date range

× Clear

🔍 Search

You can adjust where you're searching by selecting the dropdown menu labeled "Topic." "Topic" is a foolproof one to choose. "All fields" will skew a bit broader, bringing back more results.

Go ahead and click the purple button labeled "Search" once you're done to view your results.

## Lesson 9: Translate to Embase

We've saved the hardest for last – translating to Embase. You can expect more results in Embase (typically double the number of Medline results) as it is a large database. Embase also contains more pharmaceutical papers, so if your paper examines a specific medication, you'll get back even more results.

Embase is a subscription platform. Check with your library to see if they have access. MGB employees can access [Embase via HMS](#). If you don't have a Harvard Key, any MGB physician can sponsor you for a library [proxy account](#). Another option is to [purchase temporary access using Elsevier Shop](#) (note this can be quite expensive).

If this isn't an option, you can exclude Embase altogether using an excerpt from the Cochrane Handbook as your justification. [The Cochrane handbook says](#): "The Cochrane Central Register of Controlled Trials (CENTRAL) and MEDLINE, together with Embase (if access to Embase is available to the review team), should be searched for all Cochrane Reviews."

### Getting Started with the Translation

Copy and paste your **original Medline search** into a new Word document. It's easiest to make the changes in a separate word document then copy and paste the finished search into the appendix. Here's an overview of the changes we'll be making:

- Field tags will be changed
- Single quotation marks will surround phrases
- MeSH terms will be substituted for Embase's subject headings
- Keywords that have equivalent subject headings will be added

### Keyword Formatting

Make the following changes to your keywords:

- Change every .ti,ab,kw or [tiab] to :ab,ti,kw (period turns into a colon)
- Any **phrase** (breast cancer, e.g.) must be surrounded by **single quotes**
- Remove any accents on letters or apostrophes in words otherwise Embase will refuse to process your search

Below is an example of properly formatted keywords:

('human immunodeficiency virus\*' OR HIV OR 'AIDS virus\*' OR 'acquired immune deficiency syndrome virus\*' OR 'acquired immunodeficiency syndrome virus\*' OR 'Human T Cell Lymphotropic Virus Type III'):ab,ti,kw

You could use an AI tool here. Don't ask it to translate the search for you. Instead, say something like: "I'm going to give you a block of text. I need you to put each word in single quotes excluding the word 'or.'" Then, give it the text you need formatted and check for errors.

## What are Emtree Terms?

Embase *does* use subject headings. They call them Emtree terms. Just like Medline, Embase's subject headings use **explosion**. This means you must check beneath every subject heading, as nested terms will differ from MeSH.

Check for an equivalent Emtree term for:

- Every MeSH term
- Each keyword

You should look up each keyword because Embase has more subject headings than MeSH. Plus, oftentimes there is an Emtree term with no MeSH equivalent.

## Searching for Emtree Terms

To get to the Emtree thesaurus, click Emtree in the upper right corner from Embase's main page. You will see this page when you first sign in.

The screenshot shows the Embase website interface. At the top, there is a navigation bar with the Embase logo, a search bar, and links for Search, Emtree, Journals, Results, My tools, and a Sign in button. Below the navigation bar is a 'Quick search' section with a 'Select Language' dropdown. Underneath, there are tabs for Quick, PICO, PV Wizard, Medical device, Advanced, Drug, Disease, Device, and Citation information. The main content area has the text 'Find articles by simple keyword search or build more complex queries' and a 'Search tips' link. A search input field contains the text 'Broad search e.g. 'heart attack' AND stress'. Below the input field are links for '+ Add field', 'Limit to', and 'Reset form'. At the bottom of the search area is a 'Show results' button and a 'Display full query' link.

Look up each MeSH term and keyword, one by one, to see if you can find an equivalent Emtree term.

As you type a word, you'll see suggested terms populate. The word after "use" is the Emtree term. For example, in the image below, you can see that a bunch of synonyms

(HIV disease, HIV diseases, HIV infections, e.g.) use the same Emtree term: "Human immunodeficiency virus infection."

 **Embase**

Search 

**Emtree**

## Browse Emtree

Search term in Emtree  
HIV 

|                                                                                                                     |         |
|---------------------------------------------------------------------------------------------------------------------|---------|
| <input checked="" type="radio"/> HIV use: Human immunodeficiency virus                                              | 222,143 |
| <input checked="" type="radio"/> HIV (HTLV-III) infection use: Human immunodeficiency virus infection               | 845,218 |
| <input checked="" type="radio"/> HIV disease use: Human immunodeficiency virus infection                            | 845,218 |
| <input checked="" type="radio"/> HIV diseases use: Human immunodeficiency virus infection                           | 845,218 |
| <input checked="" type="radio"/> HIV infection use: Human immunodeficiency virus infection                          | 845,218 |
| <input checked="" type="radio"/> HIV infections use: Human immunodeficiency virus infection                         | 845,218 |
| <input checked="" type="radio"/> HIV seropositivity use: Human immunodeficiency virus infection                     | 845,218 |
| <input checked="" type="radio"/> HIV/AIDS use: acquired immune deficiency syndrome                                  | 598,563 |
| <input checked="" type="radio"/> HIV-associated opportunistic infections use: AIDS-related opportunistic infections | 466,619 |
| <input checked="" type="radio"/> HIV-related opportunistic infections use: AIDS-related opportunistic infections    | 466,619 |

- ☐ health care concepts
- ☐ named groups of persons
- ☐ organisms

Click the first Emtree term you would like to include to see its information. In this case, we'll click "Human immunodeficiency virus" to view its information:

The screenshot shows the Emtree interface. On the left, a tree structure lists terms from 'Emtree' down to 'Human immunodeficiency virus'. On the right, the 'Term information' pane for 'Human immunodeficiency virus' is displayed, showing 14 synonyms and a 'Query builder' section with a search button indicating 222,147 results.

You'll see several things:

- Broader terms are listed above the term
- Narrower terms are listed below
- Any term with a white circle next to it has even more terms beneath it. Click the white circle to see what's nested
- Suggested synonyms are listed

Check **all nested terms**. Can you find any irrelevant ones? If you're okay with the nested terms, click **+ Add to query builder**, and you'll get a correctly formatted Emtree term. Notice how the formatting differs from a MeSH term:

|              |                                    |
|--------------|------------------------------------|
| Emtree term: | 'Human immunodeficiency virus'/exp |
| MeSH term:   | exp HIV/<br>"HIV"[MeSH]            |

If you see irrelevant nested terms, we must ensure the Emtree term is **not exploded**. Change exp to **de** which stands for "don't explode":

|                         |                                   |
|-------------------------|-----------------------------------|
| Unexploded Emtree term: | 'Human immunodeficiency virus'/de |
|-------------------------|-----------------------------------|

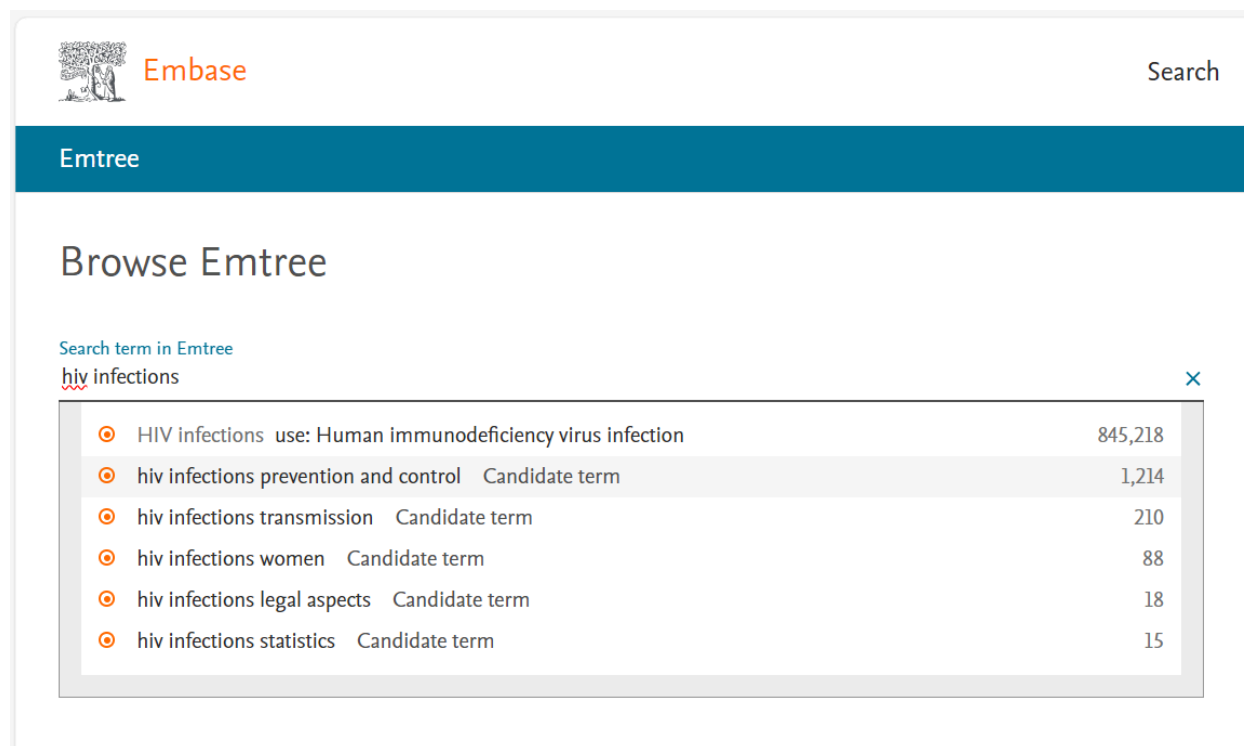
But wait! This now excludes *all* nested terms. Are there any narrower terms on the list you do want? If so, add them to your search like so:

'Human immunodeficiency virus'/de OR 'Human immunodeficiency virus 1'/exp

**Look back to your keywords.** Are any of the Emtree terms giving you inspiration for new keywords? If so, add them to each database search so everything matches, not just Embase.

You may look up the same word multiple times to get to all the Emtree terms you need (in this case, we need to look up HIV again to check out the other Emtree terms we initially saw).

As you look up words, you may see a "candidate term." A **candidate term** is added when no suitable Emtree term exists. It *does not* use explosion. It's up to you whether to add candidate terms. Be aware they can sometimes lead to inflated result numbers.



The screenshot shows the Embase Emtree search interface. At the top, there is an Embase logo and a search bar. Below the search bar, the word "Emtree" is displayed. The main section is titled "Browse Emtree". A search box contains the text "hiv infections". Below the search box, a list of search results is shown, each with a radio button, the term, and the number of results.

| Search term in Emtree                                      | Results |
|------------------------------------------------------------|---------|
| HIV infections use: Human immunodeficiency virus infection | 845,218 |
| hiv infections prevention and control Candidate term       | 1,214   |
| hiv infections transmission Candidate term                 | 210     |
| hiv infections women Candidate term                        | 88      |
| hiv infections legal aspects Candidate term                | 18      |
| hiv infections statistics Candidate term                   | 15      |

Copy and paste the properly formatted Emtree term into the correct line within your Word document, making sure to connect it with OR.

After that, look up the next MeSH term or keyword. Or, look up the same term again if

you saw multiple relevant Emtree terms in the last step.

**This is a time-intensive process.** Embase's translation will likely take the longest out of all the databases you search in.

Once finished, you should have something like the example below. In anticipation of the final step, fill out the last line with the appropriate line numbers connected by AND in the last line. You'll put a # before the number when referring to a line.

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | ('human immunodeficiency virus*' OR HIV OR 'AIDS virus*' OR 'acquired immune deficiency syndrome virus*' OR 'acquired immunodeficiency syndrome virus*' OR 'Human T Cell Lymphotropic Virus Type III' OR 'Human T Cell Leukemia Virus Type III' OR 'HTLV III' OR 'Human T Lymphotropic Virus Type III' OR 'Lymphadenopathy Associated Virus*' OR PLWHA OR PWH):ab,ti,kw OR 'human immunodeficiency virus'/exp OR 'human immunodeficiency virus infection'/exp OR 'human immunodeficiency virus infected patient'/exp OR 'AIDS patient'/exp |
| 2 | ('social* disconnect*' OR 'disconnect* social*' OR 'social deprivation' OR loneliness OR lonesome OR lonely OR 'feel* alone' OR 'social* isolat*' OR friendless OR companionless OR 'social* exclusion*'):ab,ti,kw OR 'loneliness'/exp OR 'social isolation'/exp OR 'social deprivation index'/exp OR 'social connectedness'/de                                                                                                                                                                                                            |
| 3 | ('quality of life' OR QOL OR HRQOL OR 'life quality'):ab,ti,kw OR 'quality of life'/exp OR 'quality of life index'/exp OR 'quality of life questionnaire'/exp OR 'health related quality of life questionnaire'/exp OR 'quality of life assessment'/exp                                                                                                                                                                                                                                                                                    |
| 4 | #1 AND #2 AND #3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## Performing the Search

We will search for each line in the table one by one. Search for the first concept from the Results page or the main page:


Embase

[Search](#)
[Emtree](#)
[Journals](#)
[Results](#)
[My tools](#)
[?](#)

[Sign in](#)

Quick search

[Quick](#)
[PICO](#)
[PV Wizard](#)
[Medical device](#)
[Advanced](#)
[Drug](#)
[Disease](#)
[Device](#)
[Citation information](#)

Find articles by simple keyword search or build more complex queries

[Search tips »](#)

Broad search e.g. 'heart attack' AND stress  
 { 'human immunodeficiency virus infected patient'/exp OR 'AIDS patient'/exp

+ Add field    v Limit to    [Reset form](#)

Show 1,030,955 results

[Display full query](#)

Click the blue "Show results" button to search. It will show you the number of results that the concept is returning. Once searched, you'll see the concept appear in your search history:

Results

human immunodeficiency virus""ab.ti,kw OR hiv.ab.ti,kw OR 'aids virus""ab.ti,kw OR 'acquired immune deficiency syndrome virus""ab.ti,kw OR 'acquired immunodeficiency syndrome virus""ab.ti,kw OR 'human t cell lymphotropic virus type iii""ab.ti,kw OR 'human t cell leukemia virus type iii""ab.ti,kw OR 'hiv""ab.ti,kw OR 'human t lymphotropic virus type iii""ab.ti,kw OR 'lymphadenopathy associated virus""ab.ti,kw OR 'plw""ab.ti,kw OR 'pwh""ab.ti,kw OR 'human immunodeficiency virus"/exp OR 'human immunodeficiency virus infection"/exp OR 'human immunodeficiency virus infected patient"/exp OR 'aids patient"/exp

Search >   Mapping v   Date v   Sources v   Fields v   Quick limits v   EBM v   Pub. types v   Languages v   Gender v   Age v   Animal v   [Search tips v](#)

Results Filters    ☐ History    Save | Delete | Print view | Export | Email    Combine >    using ☒ And    ☐ Or    ^ Collapse

+ Expand    - Collapse all    Apply >

Sources v

#1    'human immunodeficiency virus""ab.ti,kw OR hiv.ab.ti,kw OR 'aids virus""ab.ti,kw OR 'acquired immune deficiency syndrome virus""ab.ti,kw OR 'acquired immunodeficiency syndrome virus""ab.ti,kw OR 'human t cell lymphotropic virus type iii""ab.ti,kw OR 'human t cell leukemia virus type iii""ab.ti,kw OR 'hiv""ab.ti,kw OR 'human t lymphotropic virus type iii""ab.ti,kw OR 'lymphadenopathy associated virus""ab.ti,kw OR 'plw""ab.ti,kw OR 'pwh""ab.ti,kw OR 'human immunodeficiency virus"/exp OR 'human immunodeficiency virus infection"/exp OR 'human immunodeficiency virus infected patient"/exp OR 'aids patient"/exp    1,030,955

Search for the next concept by deleting the text inside the box. Then, copy and paste your second concept. Then click search.

After you have searched for each concept, you are ready to combine them. Check off the box directly to the left of History. Then, click the blue Combine button:

☒ History    Save | Delete | Print view | Export | Email    Combine >    using ☒ And    ☐ Or    ^ Collapse

☒ #3    'quality of life""ab.ti,kw OR qol.ab.ti,kw OR 'hrqol.ab.ti,kw OR 'life quality""ab.ti,kw OR 'quality of life"/exp OR 'quality of life index"/exp OR 'quality of life questionnaire"/exp OR 'health related quality of life questionnaire"/exp OR 'quality of life assessment"/exp    844,315

☒ #2    'social" disconnect""ab.ti,kw OR 'disconnect" social""ab.ti,kw OR 'social deprivation""ab.ti,kw OR 'loneliness""ab.ti,kw OR 'lonesome""ab.ti,kw OR 'lonely""ab.ti,kw OR 'feel" alone""ab.ti,kw OR 'social" isolat""ab.ti,kw OR 'friendless""ab.ti,kw OR 'companionless""ab.ti,kw OR 'social" exclusion""ab.ti,kw OR 'loneliness"/exp OR 'social isolation"/exp OR 'social deprivation index"/exp OR 'social connectedness"/de    62,116

☒ #1    'human immunodeficiency virus""ab.ti,kw OR hiv.ab.ti,kw OR 'aids virus""ab.ti,kw OR 'acquired immune deficiency syndrome virus""ab.ti,kw OR 'acquired immunodeficiency syndrome virus""ab.ti,kw OR 'human t cell lymphotropic virus type iii""ab.ti,kw OR 'human t cell leukemia virus type iii""ab.ti,kw OR 'hiv""ab.ti,kw OR 'human t lymphotropic virus type iii""ab.ti,kw OR 'lymphadenopathy associated virus""ab.ti,kw OR 'plw""ab.ti,kw OR 'pwh""ab.ti,kw OR 'human immunodeficiency virus"/exp OR 'human immunodeficiency virus infection"/exp OR 'human immunodeficiency virus infected patient"/exp OR 'aids patient"/exp    1,030,797

844,315 results for search #3     Set email alert     Set RSS feed     Search details     Index miner

After doing that, you should see a line with the numbered lines connected by AND. Whatever number is listed to the right (in this case, 219) is the final number of results:

☐ History   Save | Delete | Print view | Export | Email   Combine >   using ☒ And ☐ Or   [Collapse](#)

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <input type="checkbox"/> #4 | #1 AND #2 AND #3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 210       |
| <input type="checkbox"/> #3 | 'quality of life':ab,ti,kw OR qol:ab,ti,kw OR hrqol:ab,ti,kw OR 'life quality':ab,ti,kw OR 'quality of life'/exp OR 'quality of life index'/exp OR 'quality of life questionnaire'/exp OR 'health related quality of life questionnaire'/exp OR 'quality of life assessment'/exp                                                                                                                                                                                                                                                                                                                                                     | 844,315   |
| <input type="checkbox"/> #2 | 'social' disconnect:ab,ti,kw OR 'disconnect' social:ab,ti,kw OR 'social deprivation':ab,ti,kw OR loneliness:ab,ti,kw OR lonesome:ab,ti,kw OR lonely:ab,ti,kw OR 'feel' alone:ab,ti,kw OR 'social' isolat:ab,ti,kw OR friendless:ab,ti,kw OR companionless:ab,ti,kw OR 'social' exclusion:ab,ti,kw OR 'loneliness'/exp OR 'social isolation'/exp OR 'social deprivation index'/exp OR 'social connectedness'/de                                                                                                                                                                                                                       | 62,116    |
| <input type="checkbox"/> #1 | 'human immunodeficiency virus':ab,ti,kw OR hiv:ab,ti,kw OR 'aids virus':ab,ti,kw OR 'acquired immune deficiency syndrome virus':ab,ti,kw OR 'acquired immunodeficiency syndrome virus':ab,ti,kw OR 'human t cell lymphotropic virus type iii':ab,ti,kw OR 'human t cell leukemia virus type iii':ab,ti,kw OR 'htlv iii':ab,ti,kw OR 'human t lymphotropic virus type iii':ab,ti,kw OR 'lymphadenopathy associated virus':ab,ti,kw OR plw:ab,ti,kw OR pwh:ab,ti,kw OR 'human immunodeficiency virus'/exp OR 'human immunodeficiency virus infection'/exp OR 'human immunodeficiency virus infected patient'/exp OR 'aids patient'/exp | 1,030,797 |

210 results for search #4   [Set email alert](#)   [Set RSS feed](#)   [Search details](#)   [Index miner](#)

☐ Results   View | Export | Email | Add to Clipboard   1 — 25   [Show all abstracts](#) | Sort by: ☐ Relevance ☐ Author ☒ Publication Year ☐ Entry Date

Select number of items   Selected: 0 (clear)   [Show all abstracts](#) | Sort by: ☐ Relevance ☐ Author ☒ Publication Year ☐ Entry Date

|                            |                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> 1 | Identifying the needs of older people living with HIV (≥ 50 years old) from multiple centres over the world: a descriptive analysis<br>Grosso T.M., Hernández-Sánchez D., Dragovic G., Vasylyev M., Saumoy M., Blanco J.R., García D., Koval T., Loste C., Westerhof T., Clotet B., Sued O., Cahn P., Negrodo E.<br><i>AIDS Research and Therapy</i> 2023 20:1 Article Number 10 Cited by: 1 |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Embase MEDLINE   [Abstract](#)   [Index Terms](#)   [View Full Text](#)   [TRY HARVARD LIBRARY](#)   [Similar records >](#)

**Always make sure the processed search matches what you originally typed.**  
Below is an example of a search with a mistake. Can you spot the error?

**Results**   [Select Language](#)

#1 AND #2 AND #3

[Search >](#)   Mapping   Date   Sources   Fields   Quick limits   EBM   Pub. types   Languages   Gender   Age   Animal   [Search tips](#)

**Results Filters**

[+ Expand](#)   [- Collapse all](#)   [Apply](#)

Sources [v](#)

Drugs [v](#)

Diseases [v](#)

Devices [v](#)

Floating Subheadings [v](#)

☐ History   Save | Delete | Print view | Export | Email   Combine >   using ☒ And ☐ Or   [Collapse](#)

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <input type="checkbox"/> #4 | #1 AND #2 AND #3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 219       |
| <input type="checkbox"/> #3 | 'quality of life':ab,ti,kw AND of:ab,ti,kw AND life:ab,ti,kw OR qol:ab,ti,kw OR hrqol:ab,ti,kw OR life ab,ti,kw OR life ab,ti,kw AND quality:ab,ti,kw OR 'quality of life'/exp OR 'quality of life index'/exp OR 'quality of life questionnaire'/exp OR 'health related quality of life questionnaire'/exp OR 'quality of life assessment'/exp                                                                                                                                                                                                                                                                                       | 904,544   |
| <input type="checkbox"/> #2 | 'social' disconnect:ab,ti,kw OR 'disconnect' social:ab,ti,kw OR 'social deprivation':ab,ti,kw OR loneliness:ab,ti,kw OR lonesome:ab,ti,kw OR lonely:ab,ti,kw OR 'feel' alone:ab,ti,kw OR 'social' isolat:ab,ti,kw OR friendless:ab,ti,kw OR companionless:ab,ti,kw OR 'social' exclusion:ab,ti,kw OR 'loneliness'/exp OR 'social isolation'/exp OR 'social deprivation index'/exp OR 'social connectedness'/de                                                                                                                                                                                                                       | 62,122    |
| <input type="checkbox"/> #1 | 'human immunodeficiency virus':ab,ti,kw OR hiv:ab,ti,kw OR 'aids virus':ab,ti,kw OR 'acquired immune deficiency syndrome virus':ab,ti,kw OR 'acquired immunodeficiency syndrome virus':ab,ti,kw OR 'human t cell lymphotropic virus type iii':ab,ti,kw OR 'human t cell leukemia virus type iii':ab,ti,kw OR 'htlv iii':ab,ti,kw OR 'human t lymphotropic virus type iii':ab,ti,kw OR 'lymphadenopathy associated virus':ab,ti,kw OR plw:ab,ti,kw OR pwh:ab,ti,kw OR 'human immunodeficiency virus'/exp OR 'human immunodeficiency virus infection'/exp OR 'human immunodeficiency virus infected patient'/exp OR 'aids patient'/exp | 1,030,955 |

219 results for search #4   [Set email alert](#)   [Set RSS feed](#)   [Search details](#)   [Index miner](#)

The number of results should be more than the number of Medline results. But if you're getting back an astronomical number of results or far fewer results than your Medline search, something has gone wrong with the search. Check for syntax errors.

Remember that searching involves **refinement** and **troubleshooting**. It's common, especially as a new searcher, to make errors and try many searches before getting to the final version of your search.

## Tools You Can Use

Embase has introduced the Query Translator tool that promises to translate your PubMed search to Embase syntax. It will highlight in red any words it can't find a match for.

We mention this tool at the end of the lesson because it's essential to understand the mechanics of an Embase search before using it. You don't want to create an Embase search you don't understand because you'll be stuck if you make a mistake or want to change something in the search. But once you get the hang of translation, it's not a bad idea to take advantage of this.



## Lesson 10: Troubleshoot Your Search

### Help! Something Went Wrong with My Search

Troubleshooting is an integral part of searching. Even the most experienced searchers need to finetune and correct their work. Think of this step as similar to editing the rough draft of an essay. This lesson will cover how to find and identify mistakes in your search.

Some signs your search has a mistake in it:

- The database refuses to process your search
- You see an error message (typically a banner at the top of the page)
- Your search or a concept within your search is bringing back zero results
- Your search is bringing back hundreds of thousands or millions of results
- You see a red exclamation mark under History and Search Details in PubMed

Some databases are better at telling you what you did wrong than others through their error messages. Web of Science and Ovid (Medline and Cochrane) will tell you your mistake. Ovid will do so in the yellow banner that appears at the top of the screen. Embase will give you more vague error messages.

[Medsyntax](#) is a handy tool that promises to identify errors in your search strategy. It's not perfect (for example it erroneously identified an Emtree term with parentheses as an error), but still can be quite useful for things like identifying missing quotes, etc.

### Check Your Text Document

Use the find feature to search for common errors within the document containing your search. It will detect mistakes or highlight the character to illustrate where one is missing.

Here are some common errors to search for:

- OR OR
- AND AND
- Periods in your Embase search. Those should be colons

Here are some things to search for to check for missing characters:

- Single quotes. All phrases and Emtree terms in your Embase search must have those
- Parentheses. Any open parentheses must have a corresponding closed parentheses
- Stop words. Put quotes around any stop words. [Here's a list of stop words by database.](#)

## Check the Executed Search

Perform your search and examine it. Does the executed search in the database match precisely what you have, or did the database add new characters or words?

Use the find feature in your browser to search for the following:

- New AND's
- New OR's
- New .mp in Ovid
- New parentheses

You have a syntax error if any of these have been added to your search.

## Isolating Errors

If you see an error message, try to isolate the mistake by breaking apart a concept into smaller pieces. For example, the line below contains an error:

'africa'/exp OR africa\*:ti,ab,kw OR african union'/exp

If you search for each of these three elements independently, you'll find your error. So you would first search for 'africa'/exp then africa\*:ab,ti,kw then finally african union'/exp

## Troubleshooting Based on Number of Results

You can also troubleshoot based on the number of results. If you get back too many results, check the number next to each concept. The concept returning the most results is likely the problem. What terms in that concept are too broad? Check all of your explosions as well.

If you get back too few results, check the number next to each concept. The concept returning the fewest results is likely the problem. What words are too focused? Do you need to explode a subject heading?

In the image below, AND in all caps is being searched for. As you can see, no new AND's have been added to the search other than the ones we intended, which is a sign the search is running correctly:

The screenshot shows a PubMed search interface. At the top, there's a search bar with 'AND|' and a results count of 3/56. Below the search bar are navigation links: Search, Emtree, Journals, Results (highlighted), My tools, and a Sign in button. A 'Select Language' dropdown is also visible. Below the navigation bar, there are filters for Fields, Quick limits, EBM, Pub. types, Languages, Gender, Age, and Animal. A 'Search tips' link is on the right. The main section is a search history table with columns for checkboxes, item numbers, search terms, and result counts. Entry #1 is highlighted in yellow and contains a red exclamation mark. The search terms for entry #1 are: 'human immunodeficiency virus' OR 'hiv' OR 'aids virus' OR 'acquired immune deficiency syndrome virus' OR 'acquired immunodeficiency syndrome virus' OR 'human t cell lymphotropic virus type iii' OR 'human t cell leukemia virus type iii' OR 'htlv iii' OR 'human t lymphotropic virus type iii' OR 'lymphadenopathy associated virus' OR 'plw' OR 'pwh' OR 'human immunodeficiency virus' OR 'human immunodeficiency virus infection' OR 'human immunodeficiency virus infected patient' OR 'aids patient'.

|    | History                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Save | Delete | Print view | Export | Email | Combine > | using | And | Or |           | Collapse |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------|------------|--------|-------|-----------|-------|-----|----|-----------|----------|
| #4 | #1 AND #2 AND #3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |        |            |        |       |           |       |     |    | 210       |          |
| #3 | 'quality of life'.ab,ti,kw OR qot.ab,ti,kw OR hrqot.ab,ti,kw OR 'life quality'.ab,ti,kw OR 'quality of life'/exp OR 'quality of life index'/exp OR 'quality of life questionnaire'/exp OR 'health related quality of life questionnaire'/exp OR 'quality of life assessment'/exp                                                                                                                                                                                                                                                                                                                                                     |      |        |            |        |       |           |       |     |    | 844,315   |          |
| #2 | 'social' disconnect'.ab,ti,kw OR 'disconnect' social'.ab,ti,kw OR 'social deprivation'.ab,ti,kw OR loneliness.ab,ti,kw OR lonesome.ab,ti,kw OR lonely.ab,ti,kw OR 'feel' alone'.ab,ti,kw OR 'social' isolat'.ab,ti,kw OR friendless.ab,ti,kw OR companionless.ab,ti,kw OR 'social' exclusion'.ab,ti,kw OR 'loneliness'/exp OR 'social isolation'/exp OR 'social deprivation index'/exp OR 'social connectedness'/de                                                                                                                                                                                                                  |      |        |            |        |       |           |       |     |    | 62,116    |          |
| #1 | 'human immunodeficiency virus'.ab,ti,kw OR hiv.ab,ti,kw OR 'aids virus'.ab,ti,kw OR 'acquired immune deficiency syndrome virus'.ab,ti,kw OR 'acquired immunodeficiency syndrome virus'.ab,ti,kw OR 'human t cell lymphotropic virus type iii'.ab,ti,kw OR 'human t cell leukemia virus type iii'.ab,ti,kw OR 'htlv iii'.ab,ti,kw OR 'human t lymphotropic virus type iii'.ab,ti,kw OR 'lymphadenopathy associated virus'.ab,ti,kw OR plw.ab,ti,kw OR pwh.ab,ti,kw OR 'human immunodeficiency virus'/exp OR 'human immunodeficiency virus infection'/exp OR 'human immunodeficiency virus infected patient'/exp OR 'aids patient'/exp |      |        |            |        |       |           |       |     |    | 1,030,797 |          |

For your PubMed search, click Advanced under the search bar and look at History and Search Details. Do you see a red exclamation mark anywhere? If so, click the greater than symbol under Details. It's OK if you see an error that says, "Quoted phrases not found in phrase index." That means that your specific keyword wasn't found. But watch out for any other error message.

## Asking for Help

You can also try to figure things out by reading the appropriate manual. Think of these as the IKEA instructions for each database! It's not that different from everyday life; if a light on your car dashboard turns on, you can save yourself some money by finding and reading the manual before heading to a mechanic. Same idea here.

Below are manuals as well as support pages for the databases this course covers.

### PubMed

- [PubMed user guide](#)
- [Help desk](#): follow the directions under NCBI Help Desk

### Cochrane

- [Cochrane CENTRAL manual](#)
- [support@ovid.com](mailto:support@ovid.com)

### Web of Science

- [Manual](#)
- [Help desk](#)

### Embase

- [Manual](#): click "Video Tutorials" or "Using the Product"

- [Help desk](#)

## **Lesson 11: Export Your Results**

Once you are finished and happy with your searches, you'll need to get the results out of the databases you searched to combine them and remove duplicates. You'll want to save each file as an RIS file. You'll also see RIS files referred to as RefMan (RIS).

Try to export the results of all of your searches on the same day. That way you only have to list one date in your methods section.

As you download each file, label each as the database name and number of results and/or create a document detailing all of this information. You'll need these numbers for your PRISMA flow diagram and if you need to perform an update of the search. Databases have export limits. If that happens, save as many files as you need, making sure at least one file has the total number of results included in its file name.

### **How to Download Results by Database**

Below are short videos explaining how to export out of each of the core databases, but in general, a good rule of thumb is to look for a link with words like "send to," "export," "download," or "RIS."

- [Cochrane CENTRAL](#)
- [Embase](#)
- [Web of Science](#)
- [PubMed](#)

## Lesson 12: Getting Started with Screening

Now that you've gotten the results out of the databases, you'll need to screen results, remove duplicates, and fill out your PRISMA flow diagram. Screening will be broken up into two steps: title and abstract screening and full-text screening. Try to be ruthless during the first step when you're just reading the titles and abstracts to cut down on the number of papers you have to read (and possibly purchase).

The easiest way to screen, perform data extraction and risk of bias assessment is to use a **screening software**. [Rayyan](#), [DistillerSR](#), [Catchii](#), [Covidence](#), [PICO Portal](#), [TERA Tools](#), [RevMan](#) and [EPPI-Reviewer](#) are all options for this sort of software (EPPI-Reviewer is a personal favorite of mine). These programs provide one convenient place to upload your citations to streamline screening and risk of bias assessment. Some of these tools are AI-powered or offer AI features to speed up the review process.

If you use such a software, make sure to cite the program in your methods section. To figure out how to cite it, just Google something like "Rayyan citation," or modify the [APA citation for a software program](#).

These programs can vary in price from very reasonable to bonkers insane. If you don't have the funds for screening software, you can always use a citation manager like [Zotero](#), [EndNote](#), or [Mendeley](#) to screen and perform data extraction using [Google Forms](#). This will be more cumbersome, though. I've even heard of teams screening using Excel but would not recommend it due to how laborious that is.

### Deduplication

Removing duplicate papers is called deduplication and is done for several reasons. You'll need the number of duplicates to complete your PRISMA flow diagram. Deduplication will also save you time because you won't be screening the same papers repeatedly.

Most screening software programs will deduplicate your papers once you upload them. You can also deduplicate using [ASySD](#), [Catchii](#), [Zotero](#), [Deduplicate.it](#), or [EndNote](#). If you're using EndNote, Leeds University has an effective [method](#) for deduplicating using that program.

The number of duplicates should be high because we are running the same search in multiple databases. If you have a low number (30 for a search returning 1,000 results), stop deduplicating and return to your search. A low number means something has gone wrong with your search, and you must go back and correct your errors.

The reason for low duplicates would be a translation error. In other words, the different database searches are too dissimilar for a high degree of overlap between results to exist. This could be for several reasons, such as:

1. An explosion error: The nested terms beneath subject headings do not match across the databases
2. The keywords between searches do not match exactly
3. A keyword is truncated in one database search but not another
4. There is a typo in the syntax
5. The field tags across databases are not similar enough

## PRISMA Flow Diagram

A PRISMA flow diagram records the number of papers found, duplicates, number of papers screened, irrelevant studies, full-text studies screened, and included studies. All papers must be accounted for within this diagram. PRISMA offers a few options but the second option [on this page is the best one to use](#) because it has space for “other methods” (ways beyond the search such as hand searching and citation chasing you used to find papers which point to a robust search technique).

Some people will list out the results for each database (i.e., 600 results from PubMed, e.g.). That is the optimal way to track things because it provides more detail. You’ll also include how many duplicate papers were found. Next, you’ll list how many papers made it to the full-text screening round and how many you were able to acquire a PDF for. Then, you’ll start listing out the reasons for exclusion (i.e., “wrong population”). It’s OK to keep those reasons brief, since you’re trying to squeeze them into a fairly small diagram.

The boxes on the left record all papers found through databases used in the literature search. The box on the right tracks papers found through the other methods listed above. Keep those two sets of papers separate.

## Full Text Screening

After you have screened the titles and abstracts of the papers, it becomes time to actually read the papers (AKA full text screening). Remember: it’s not uncommon to find there are articles that only have an abstract, and haven’t resulted in a published paper. If that happens, you can exclude them by marking them as “abstract only” in your PRISMA diagram.

But how can you get to all of those papers? There are a few steps you can take.

### Step 1: Locate Open Access Papers

First, find all the freely available papers or **open access papers**. To find open access papers, download the browser extension [Unpaywall](#), [EndNote Click](#), or you can import your papers into Zotero (import the RIS file we talked about in Lesson 11), and right-click the results. [Click “Find Available PDFs.”](#) Zotero will attempt to find a PDF for

every paper it can.

## **Step 2: Locate What Your Library Owns**

Next, use your library's online catalog to look up each article one by one. This is where having a team is essential because that way, at least someone on the team has access to a library. The online catalog is typically on the homepage of your library's website.

## **Step 3: Locate What Your Library Doesn't Own**

Your library may not have immediate access to every article you'd like to read. That's okay, though! You can use something called **interlibrary loan** to find the remaining articles. **Interlibrary (ILL)** is a service that allows libraries to borrow materials from other libraries on behalf of their patrons.

Interlibrary loan is almost always free but check to make sure there aren't any fees, otherwise gathering articles will quickly become expensive. A more expensive alternative to interlibrary loan is to purchase individual articles through the [Copyright Clearance Center, a private, fee-based, document delivery company](#).

## Lesson 13: Data Extraction, Risk of Bias Assessment and Certainty Assessment

### Extraction

Once you've finished full text screening, you're on to **data extraction**. Data extraction refers to pulling out (or "extracting") relevant details from your final set of papers. You should have drafted a list of those details in your protocol. This can include things like how long the medication was administered for in the study you're reading, what the dosage was, or demographic details about the patient population.

Think of extraction like you're holding a clipboard with a checklist, examining each article and checking off whether it fits your needs or not. This paper looked at patients in their 80s? Not what we're after; our patient population needs to be 50 to 70. This study was cross-sectional? Nope, we only want cohort studies.

If you're using a screening software, that will streamline data extraction. But if you don't have access to a screening software, you can use REDCap or even Google Forms to extract data.

To learn how to extract data, [UNC's libraries have a helpful page](#) on how to do so in any number of software programs. But really, you're just creating a form that you can use to assess the studies. Here's a [handy example data extraction form](#) from DistillerSR you can use for inspiration.

### What is Risk of Bias?

Risk of bias (RoB) assessment is how you'll assess your final set of articles for methodological issues. Best practice is to not remove the studies who "fail" RoB so to speak, but instead to note each study and its corresponding grade in a table.

Scoping reviews skip this step typically. Rapid reviews *do* include RoB but they expedite or omit steps in the process due to lack of time. For example, you may use only one reviewer or simplify which "domains" of a paper you'll be assessing. Make sure to note where you skipped or accelerated steps and note it as a limitation of your paper.

"Critical appraisal" is technically different from risk of bias. Critical appraisal is used for patient care to make sure your treatment plan is backed up by high quality evidence. However, if you're assessing observational studies, there's a chance you may need to incorporate a critical appraisal tool into your screening alongside your RoB tool.

Also, there is quite a bit of overlap between the questions you'll see on critical appraisal and RoB checklists. Both can inform each other as well. Gaining competency in RoB will help you assess articles when treating patients and understanding critical appraisal will familiarize you with some of the things you'll encounter in RoB assessment. It's also just a handy skill to have in general – to understand the difference between a poorly conducted and high quality study.

## Tools

There are different **tools** used in RoB. These tools are checklists and list out what you should assess in each paper. The assessment questions are grouped in different **domains**. For example, in Cochrane's tool, there's an entire domain dedicated to questions about how the study was randomized.

In your methods section, make sure you cite which tool(s) you use to stay in compliance with [PRISMA](#). If you adapted any of the tools listed below, note that as well. You may need to incorporate multiple tools, since each is designed for a certain type of study design. Cochrane's tool is used for randomized studies. Thus, projects that just focus on RCTs will have an easier time than projects focusing on several study designs.

Below are some commonly used risk of bias tools:

- [RoB 2 tool](#) (for randomized studies)
- [ROBINS-I tool](#) (for non-randomized studies testing interventions)
- [ROBINS-E tool](#) (for non-randomized studies of exposures)
- [JBI Critical Appraisal tools](#) (for qualitative studies and other study designs)

## Grading Each Paper

Risk of bias won't be performed for an entire study; instead it will be performed for an individual outcome of that study. Cochrane acknowledges that isn't realistic to assess every outcome and says it's fine to pick the main ones (whatever will be included in your "Summary of Findings" table).

Just like with screening, you'll need more than one person to extract data and perform risk of bias. The gold standard for extraction and RoB is to have two people perform it, which will be noted in your manuscript. You will assign one of three grades to each paper:

1. Low risk of bias
2. Some concerns
3. High risk of bias

[The table below explains how you would assign a grade for each paper:](#)

**Table 3** Approach to reaching an overall risk-of-bias judgment for a specific result

| Overall risk-of-bias judgment | Criteria                                                                                                                                                                                                             |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low risk of bias              | The study is judged to be at low risk of bias for all domains for this result                                                                                                                                        |
| Some concerns                 | The study is judged to raise some concerns in at least one domain for this result, but not to be at high risk of bias for any domain                                                                                 |
| High risk of bias             | The study is judged to be at high risk of bias in at least one domain for this result, or the study is judged to have some concerns for multiple domains in a way that substantially lowers confidence in the result |

In your protocol (included in the protocol template we've provided), you should have identified which risk of bias quality indicators you'll be assessing (appropriate generation of random allocation sequence, concealment of the allocation sequence, blinding, and proportion of patients lost to follow-up, e.g.). For RCTs and non-randomized studies of intervention, you'll be conducting your assessment on a specific result or results from the study (typically the [main findings](#) which can be found in a "Summary of Findings" table [[Source](#)]).

## Presenting Your Findings

You will have a table that includes all of the study information from the final set of papers, as well as each paper's grade. Typically, low risk of bias is indicated in green, some concerns will be yellow and high risk of bias would be red.

[Robvis](#) is a handy tool that creates risk-of-bias assessment figures:

|       |         | Risk of bias domains |    |    |    |    |         |
|-------|---------|----------------------|----|----|----|----|---------|
|       |         | D1                   | D2 | D3 | D4 | D5 | Overall |
| Study | Study 1 |                      |    |    |    |    |         |
|       | Study 2 |                      |    |    |    |    |         |
|       | Study 3 |                      |    |    |    |    |         |
|       | Study 4 |                      |    |    |    |    |         |
|       | Study 5 |                      |    |    |    |    |         |
|       | Study 6 |                      |    |    |    |    |         |
|       | Study 7 |                      |    |    |    |    |         |
|       | Study 8 |                      |    |    |    |    |         |
|       | Study 9 |                      |    |    |    |    |         |

Domains:

D1: Bias due to randomisation.

D2: Bias due to deviations from intended intervention.

D3: Bias due to missing data.

D4: Bias due to outcome measurement.

D5: Bias due to selection of reported result.

Judgement

High

Some concerns

Low

## Certainty Assessment

An additional step to complete is certainty assessment (also called quality of evidence or strength of recommendations) using the [GRADE approach](#). GRADE stands for "Grades of Recommendation, Assessment, Development, and Evaluation." This occurs after you've finished risk of bias assessment.

So, what is certainty assessment? And how is it different from risk of bias? **Risk of bias assessment** has to do with the methodological flaws in each individual paper.

**Certainty assessment** is about *all* your included studies. How confident are we in the outcomes produced by that set of papers?

There is some cross-over with risk of bias assessment. First, just like RoB, you're not looking at the papers, you're looking at the outcomes of the papers. A major difference between the two is that certainty assessment is more comprehensive. It brings in even more quality factors than risk of bias assessment.

### Should I Even Perform Certainty Assessment?

Don't assume that because your paper isn't a meta-analysis or doesn't study the effect of a drug, you're exempt from performing certainty assessment. Instead, you'll need to carefully review the [criteria for applying or using GRADE](#) to make sure your project is or isn't eligible for this step. It's not a bad idea to involve a biostatistician for this.

Here's the criteria. To use the GRADE approach, the papers you've collected need to do *one* of the following:

1. Measure an effect which falls into a range or onto one side of a cutoff point. For example, the effect of vitamin C on the duration of a cold would fall into this category because we can easily put the results of the papers into a range (cold was shortened by one week or two weeks, etc.)
2. *Or*, if the papers you've collected are qualitative, those papers need to accurately represent the phenomenon you're studying. In other words, if the findings of your included papers differ from the phenomenon you're researching (enough that it could influence policy decisions), you shouldn't use GRADE.

To understand how to use the GRADE approach, [Cochrane offers a chapter](#) on the process and the [CDC has a great chapter on it](#) as well. Certainty assessment has some overlap with risk of bias and can be thought of as an extension of the RoB process. You will grade the certainty in each "important outcome" of a study (according to PRISMA). PRISMA recommends grading them as high, moderate, low, or very low. You'll need to explain why you rated something high or low and why an outcome of a study was upgraded or downgraded in your assessment.

## Lesson 14: Performing Risk of Bias Assessment on an RCT

There may be more than one type of study design that you'll be performing risk of bias on, but we're going to use a randomized trial as an example for a few reasons. First, systematic reviews are primarily designed to assess interventions, and these studies answer interventional questions. Second, performing risk of bias for these will be the most laborious and challenging (Cochrane's RoB 2 guidance document is 72 pages!).

We'll run through Cochrane's risk of bias questions called RoB 2 and explain how to answer each. For each question, put down:

- Yes
- Probably yes
- Probably no
- No
- No information

There are preliminary questions the tool will ask you first:

- What's the study design?
  - **Individually-randomized parallel-group trial:** individuals are assigned to groups.
  - **Cluster-randomized parallel-group trial:** clusters of patients are assigned to groups
  - **Individually randomized cross-over (or other matched) trial:** patients are assigned to a group then crossover to the other group
- What was the intervention being tested? What was the comparator?
- What outcome are you performing risk of bias on? (Survival rate, e.g.)
  - What's the numerical result for that outcome?
- Are you looking at:
  - Whether participants were analyzed in the groups they were originally assigned to (**intention-to-treat**)? This means even if a patient takes the wrong treatment, they stay in the same group.
  - Whether patients adhered to their interventions? This means patients could be excluded from the results if they took the wrong treatment or forgot to take it.

If you select the second option (**adherence to interventions**), you have a follow-up question. Will you be considering:

- Interventions given to patients that don't match the protocol?
- Issues with delivery of the intervention that would have impacted the study's outcome?
- Patients refusing to take an intervention, forgetting to take it, etc.?

Let's get into the main questions. If you're performing a rapid review, you're not going to have time to answer all of these, so pick the major "domains" you would like to analyze. We'll call those domains "problems." There are five domains total.

## **PROBLEM 1: Issues with Randomization**

### **1.1 Was the allocation sequence random?**

Allocation refers to the process used to assign a study participant to an arm of a study. For example, one arm receives chocolate to see if it will improve their mood, and the other receives no chocolate or a placebo.

There needs to be an equal chance a participant will be selected for either group. We're putting it up to the fates, basically. The researchers will tell you what method they used to achieve that. Below are acceptable ways to assign patients to groups:

- coin toss
- computer-generated randomization table
- shuffling of cards or envelopes
- throwing a die

Avoid papers that used quasi-random or non-random methods:

- Assigning patients by date of birth, day of visit, etc. (quasi-random)
- Doctor or patient chooses their group (non-random)

It's essential this happens so that the groups are balanced. We don't want all the smokers to be in one group, for example. Randomization has been proven to be the best way to achieve this balance.

### **1.2 Was the allocation sequence concealed until participants were enrolled and assigned to interventions?**

Concealment is going to be a big theme throughout these questions. We're trying to reduce bias and the only way to do that is to remove human judgment from the equation. Unfortunately, no one is truly unbiased. No one is Spock.

This question is going to address bias among the researchers. Yes, even the researchers can make influenced decisions that will ruin the accuracy of the study. Randomization must be concealed from researchers. The researchers can't know who is going into what group until after the selection process (randomization) is complete.

We need to make sure researchers can't change a participant's group assignment or be able to predict who will go into which group. All of these things would influence the study's outcomes. Selection bias happens when researchers knowingly or unknowingly choose people for a group based on things that would influence the study's outcome.

What might allocation concealment look like? It could be:

- Sequentially ordered opaque envelopes containing the patients' assignment
- Researchers call a central office after a patient has been randomized to learn their assignment

Allocation is different from blinding. Blinding is about whether the participants are aware of what intervention they received. Concealed allocation is about the assignment of patients into different groups.

### **1.3 Did baseline differences between intervention groups suggest a problem with the randomization process?**

The two groups need to be similar in all respects except for one thing: whether they received the experimental treatment. "Similar" means similar in respect to baseline characteristics or prognostic factors, i.e., things that could influence the study's outcome (disease severity, age, smoking history, genetics, etc.). As we saw before, we want the groups to be balanced.

Usually you'll be able to find a list of the baseline characteristics of the participants in Table 1. This table will show you the important baseline characteristics of each group after randomization.

## **PROBLEM 2: Blinding Got Messed Up**

### **2..1. Were participants aware of their assigned intervention during the trial?**

Study participants can't know what treatment they're receiving. One participant might look at another study participant, notice they don't seem to be improving and then think differently about how the intervention is affecting them.

This is where blinding comes into play. A participant is "blinded" if they can't tell which group is receiving the treatment and which group isn't. Patients should not be able to guess what the intervention is. Interventions need to look the same, taste the same, etc. Just like randomization can be broken, blinding can be broken if participants can distinguish between the two groups.

### **2.2. Were carers and people delivering the interventions aware of participants' assigned intervention during the trial?**

More concealment! The people administering the intervention to the participants cannot know which treatment is being administered because they may have ideas about how the treatments should or shouldn't be working.. As an example, let's say the study participant had a procedure to fix their vision. If the doctor knows the participant had this procedure, they might push the subject to read more lines on the E chart ([Source](#)).

There may be situations where it would be unethical or even dangerous to do this, such as a surgical intervention. If that's the case, then the study needs to bring in a separate blinded clinician to interpret the results. Silly example but you can think of it like those blinded taste tests where people try different potato chips.

### **2.3. If Y/PY/NI to 2.1 or 2.2: Were there deviations from the intended intervention that arose because of the trial context**

We're looking for changes from the assigned intervention that would influence the study's outcome. The intervention is specified in the protocol; any deviation from what is in the protocol is considered a change.

We can't just rely on what's in the published paper. We have to go looking for a protocol. In fact, ClinicalTrials.gov actually has more complete reporting than many papers!

Cochrane gives examples where such a change would be necessary. For example, if a participant experiences dangerous side effects, they may need to be switched to a different drug. Or if a patient's cancer progresses, they may not be able to stick to the original regimen. Or perhaps a patient is non-adherent.

Ideally the protocol would have a plan in place if these situations were to happen, but that isn't always the case. The study authors need to document these changes.

#### **2.4 If Y/PY to 2.3: Were these deviations likely to have affected the outcome?**

If changes to the protocol aren't something that would influence the study's outcome, that would be a lower risk of bias.

#### **2.5. If Y/PY/NI to 2.4: Were these deviations from intended intervention balanced between groups?**

If there are changes to the assigned intervention that don't match the protocol and would influence the study's outcome, they need to be balanced between the two groups using an intention-to-treat analysis (described below).

#### **2.6 Was an appropriate analysis used to estimate the effect of assignment to intervention?**

All of the study participants must be analyzed in their originally assigned group. There can be no group switching. If a participant forgets to take their treatment, refuses to take the treatment, or takes the wrong one, they can't be switched into a different group, and they can't be removed from the results. Doing any of these things breaks randomization.

This is called intention-to-treat analysis. A modified intention-to-treat analysis is also acceptable, where the researchers exclude participants with missing outcome data.

Below are **unacceptable** analyses that are too biased:

- **Naïve per-protocol analysis** (excludes participants who didn't receive their intervention)
- **As treated analysis** (participants are analyzed according to what intervention they received instead of their original assigned group. So if a person in Group A accidentally took the treatment for Group B, they'd be analyzed as if they were in Group B).
- Any **analysis that excludes eligible participants after randomization with one exception**: if patients are excluded after randomization because they're

ineligible for the treatment and eligibility for treatment was determined after randomization.

## **2.7 If N/PN/NI to 2.6: Was there potential for a substantial impact (on the result) of the failure to analyse participants in the group to which they were randomized?**

Were any participants analyzed in the wrong group (i.e., participants who took the wrong treatment) or excluded for things like non-compliance? If so, could that have made an impact on the results? There's no hard-and-fast percentage for this. Even a small percentage of patients analyzed in the wrong group can impact the study negatively (for example, if the excluded patients have characteristics that would sway the results quite a bit).

### **PROBLEM 3: Outcomes are Missing**

#### **3.1 Were data for this outcome available for all, or nearly all, participants randomized?**

Make sure there isn't any missing outcome data. Researchers can easily manipulate the results of a study by reporting some outcomes but not others. In fact, two-thirds of the time, researchers changed a primary outcome in a study ([Source](#)).

This is called outcome reporting bias. To combat this, track down the protocols of the final included papers (if any exist) and compare those against the published papers. You can typically find those in ClinicalTrials.gov.

Here's what you're looking for:

- Changes in the outcomes
- Missing data
- Changed outcomes based on results
- Recruitment that happened after the study's start

If you see any missing data, email the study authors. Find the paper on the journal's website and you should see their email addresses. Or locate the paper in PubMed and click expand next to "Affiliations." You can also check papers to see if they've publicly shared the data of the study in some sort of data repository like OSF.

If you can't get a hold of the authors or they're unable to provide the missing data, you have to ask yourself: what are the implications of this missing data?

Cochrane writes that for continuous outcomes (questions with a range of answers), availability of data from 95% of the participants is fine.

#### **3.2 If N/PN/NI to 3.1: Is there evidence that the result was not biased by missing outcome data?**

The authors of the paper may be able to get away with missing outcome data if: they

used the correct analysis method (described in 2.6) and performed a sensitivity analysis proving the results wouldn't be changed by this missing data. Methods like Last Observation Carried Forward (LOCF) and multiple imputation to deal with missing data are not acceptable, however.

### **3.3 If N/PN to 3.2: Could missingness in the outcome depend on its true value?**

Another thing that can impact bias in a study is loss to follow-up: people who dropped out of the study or can't be located. The study needs to start and end with the same number of patients in each group and any dropouts have to be accounted for. You want your study to have at least 80% or more of patients who were followed up with. Look for the CONSORT flow diagram which tracks the progress of participants through the trial.

If we don't look at drop-outs in a study, we may think the intervention works better than it actually does. For example, a drug that seems great but in reality, a bunch of the participants couldn't tolerate the side effects.

If any patient drops out, that's considered missing outcome data. Per Cochrane, studies with patients who dropped out due to health status will have a high risk of bias. But if there is missing outcome data due to something like the failure of a measuring device or interruptions to data collection, then the risk of bias will be lower. We're looking for reasons that are unrelated to the outcome of the study. All of these reasons must be documented.

Look to see if one group had more dropouts than the other. If there are a lot of dropouts and patients not followed up with, the researchers need to assign the lost patients to the worst-case outcomes and recalculate their results to confirm their findings still stand.

Finally, check to see how long the study took. The study needs to take enough time for outcomes to occur. For example, if a movement disorder from an anti-psychotic takes years to develop, and the study was only a month, that's a problem.

### **3.4 If Y/PY/NI to 3.3: Is it likely that missingness in the outcome depended on its true value?**

Answer "yes" if:

- The amount of missing data differs between groups or if people drop out or stop being tracked at different rates in each group.
- Reasons for missing data are different between the groups.
- Censoring occurs (patients are no longer tracked for the outcome of interest. This could be because side effects were too severe, for example).
- Missing outcome data could be expected. E.g., in trials assessing treatment for schizophrenia, participants often drop out due to their symptoms and this is a well known phenomena ([Cochrane](#)).
- The missing data has a connection to what the result of study would have been. For example, if someone drops out because they felt recovered, that would suggest that the intervention would have worked. If someone drops out because

of worsening symptoms, that suggests the intervention wouldn't have worked.

Answer "no" if:

- The authors considered characteristics about the patients (age, health status, e.g.) and included those to try to explain why some of the data is missing.

#### **PROBLEM 4: Issues with Measurement**

##### **4.1 Was the method of measuring the outcome inappropriate?**

An inappropriate measurement tool might be one that has poor validity, one that isn't the gold standard, or one that couldn't capture the outcome of interest (for example, it's not sensitive enough).

##### **4.2 Could measurement or ascertainment of the outcome have differed between intervention groups?**

Both groups must be treated the same except for administration of the experimental treatment. This means: everyone gets the same instructions for taking the interventions and the same instructions for reporting back to study personnel. No group can get extra attention. Look for the word "cointerventions"; that refers to medical care given in addition to the tested intervention. If there are any, those need to be described in the methods section.

##### **4.3 If N/PN/NI to 4.1 and 4.2: Were outcome assessors aware of the intervention received by study participants?**

Again, outcome assessors and data collectors can't know who received which treatment. They need to be blinded as well. Cochrane writes that for participant-reported outcomes, you would consider the study participant to be the outcome assessor.

##### **4.4 If Y/PY/NI to 4.3: Could assessment of the outcome have been influenced by knowledge of intervention received?**

You'll need to consider what the outcomes of the study are, and if patients knowing what treatment they received would affect those outcomes. Here are outcomes that would be impacted by such knowledge:

- Patient-reported outcomes. For example, patients may report their pain level as higher if they believe they received a more painful treatment.
- Observer-reported outcomes that involve some sort of judgment on the observer's part (assessment of cognitive function, e.g.)
- Decisions providers make regarding the intervention (e.g., when to perform a surgical intervention or whether or not to discharge a patient).

Patients knowing their intervention won't affect observer-reported outcomes where there's no human judgment (e.g., recording how many participants died).

#### **4.5 If Y/PY/NI to 4.4: Is it likely that assessment of the outcome was influenced by knowledge of intervention received?**

Here's how Cochrane recommends you grade the papers:

- Some concerns: A person or people knew what intervention was given to each group, but there isn't any reason to believe it would impact the outcomes and their assessment.
- High: There was a high likelihood this knowledge influenced the study's outcomes and their assessment.

This will depend on what intervention was received and how it was delivered. Cochrane gives two examples: patients are more likely to hold strong beliefs about whether a homeopathic treatment will work. Or, if the provider who delivered the treatment is also responsible for assessing its efficacy, that's going to bring in bias.

#### **PROBLEM 5: The Published Paper Doesn't Match the Protocol**

##### **5.1 Were the data that produced this result analysed in accordance with a pre-specified analysis plan that was finalized before unblinded outcome data were available for analysis?**

Check ClinicalTrials.gov and look for the "Study Plan" section. Check another trial registry if you don't see it listed. Make sure the plans for outcome measurements and analyses in the protocol match those in the paper. Any changes to these methods can't happen after the researchers were given access to unblinded outcome data.

Cochrane writes that it's fine if a change happened to these methods that wouldn't impact the results (for example, a machine breaks and the researchers can't collect data from it). It's also OK if changes were made before unblinded outcome data was made available to anyone.

##### **Is the numerical result being assessed likely to have been selected, on the basis of the results, from... 5.2. ... multiple eligible outcome measurements (e.g. scales, definitions, time points) within the outcome domain?**

One outcome could be measured multiple ways. Cochrane gives the example of pain measured using both the McGill Pain Questionnaire and a visual scale. Or, perhaps the outcome was measured at multiple points in time. If multiple measurements were made, they all need to be reported. The authors may exclude some of these measurements to make their paper look better.

Review the protocol or the authors' statistical analysis plan to see if something was measured using multiple methods, but only some of those methods were included. If that's the case, check for any sort of justification. Also, consider whether this manipulation happened to influence the results.

You're in the clear if:

- There's only one way to measure the outcome.
- Through reading the protocol or statistical analysis plan, you can see that all measurements were included.
- There's justification for excluding some measurements and this exclusion wouldn't have impacted the results.

### **5.3 ... multiple eligible analyses of the data**

A measurement of an outcome can be analyzed in more than one way. Same as before, review the protocol or statistical analysis plan. You're looking to see if a measurement was analyzed using multiple methods. If that's the case, make sure none of the data from those methods are missing and if they are, check for a justification.

Also, consider whether this manipulation happened to influence the results. There would be a high risk of bias if researchers only reported statistically significant results.

You're in the clear if:

- By reading the protocol or statistical analysis plan, you can see that all results for all outcome measurements can be linked to the correct analysis.
- There's justification for excluding some analyses and this exclusion wouldn't have impacted the results.
- There's only one way to analyze the measurement.