How to Conduct a Systematic Search

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Library course guide

Learning outcomes

- Understand the goal of systematic search strategies
- Identify databases to search
- Apply basic search techniques
- Understand, use, and properly combine subject headings and textwords in a PubMed search
- Adapt a PubMed search strategy to Embase on Ovid
- Export records to EndNote
What is a systematic search?

- “Systematic reviews of interventions require a thorough, objective and **reproducible** search of a range of sources to identify as many relevant studies as possible (within resource limits).”

- High sensitivity (often with painfully low precision)

- Well documented

How to find article databases

For guidance on selecting article databases as well as other steps of the process, please see

Systematic Reviews Wiki:
A Guide to Library Resources at McGill

Other sources of info on databases:
- Library subject guides
  http://www.mcgill.ca/library/find/subjects
- Cochrane reviews/other knowledge syntheses
What to do before initiating a review

- Make sure nobody has already done a good, recent synthesis on your topic
- Perform a scoping search to get a feel for the literature or to refine your question if needed
  - Try to incorporate subject headings and synonyms for your concepts
How to find articles: Process

1. Develop a focused research question
2. Select databases (do not rely on only one)
   a. Perform scoping searches in databases
3. Develop a full search strategy for one database
4. Run search
5. Export references to EndNote
6. Document (see PRISMA checklist)
7. Adapt the original search strategy to the next database and repeat 4 through 7
Basics of searching: ID search concepts

1. Break your question down into operationalized concepts (make sure you have clearly defined your concepts; inclusion/exclusion criteria help)
2. Identify synonymous terms for each concept set
Identify concepts

P
Heterosexual males

I
Circumcision

C
Prevention of HIV infection
Many databases allow truncation:
- E.g., diabet* picks up diabetes, diabetics...
- Note: Use with caution in PubMed

Consider using quotations for phrase searching:
- Not always necessary, depends on the database
- E.g., “primary health care”
- Note: Do not combine truncation with quotations in PubMed

Combine synonymous concepts with OR:
- E.g., “primary health care” OR “primary healthcare” OR “family medicine” OR “family physician*” OR “general practi*”...

Combine different concepts with AND:
- E.g., (Diabetes concept set) AND (primary care concept)

Use parentheses to execute your search correctly
Generally speaking, what is the correct way to enter a search query for diabetes and primary care?

A. Diabet* AND “primary health care” OR “primary healthcare” OR “family medicine” OR “general practi*”
B. Diabet* AND (“primary health care” OR “primary healthcare”) OR (“family medicine” OR “general practi*”)  
C. Diabet* AND (“primary health care” OR “primary healthcare” OR “family medicine” OR “general practi*”)
D. All of the above
Why bother with MeSH?

- cancer
- tumor(s)
- tumour(s)
- neoplasm(s)
- neoplastic

Neoplasms/

There are 27,883 descriptors in 2016 MeSH
Subject headings: Organization

- Subject headings are hierarchically structured
- Indexers assign the most precise heading available

E.g., An article about breast cancer will be indexed with the subject heading “Breast Neoplasms”, but “Neoplasms”[MeSH] will by default pick up articles indexed with narrower subject headings under it in the vocabulary tree
Identify concepts: MeSH

- Use the MeSH Database, available via the dropdown menu next to the search box in PubMed

  ![PubMed screenshot](image)

- Look at records of relevant articles
- Look at other systematic reviews
Use relevant articles you have already found to help identify additional search terms

- E.g., plug the title of a relevant article into PubMed to find the article’s MEDLINE record (if available) and then “harvest” the record for search terms (subject headings, textwords – more on textwords coming up in later slides)
Using other syntheses to find subject headings

- Examine search strategies for individual concepts as documented in published systematic reviews
  - Note of caution: They’re not always well done/easy to follow
  - Cochrane reviews are usually very well documented and often very useful – but use caution there too, compare a few
Additional trick to find subject headings: Look for records that contain your key concept(s) in the title and examine the subject headings assigned to the record.

- E.g., in PubMed: circumcision[Title] AND HIV[Title], limited to MEDLINE journal category (the latter will remove PubMed records that have not or will not be indexed with subject headings).
Use other tools to ID subject headings

- PubMed PubReminer
- Yale MeSH Analyzer
Test your skills

- Using MeSH, how would you find articles about Medicare in Canada?
Exercise

- **P**: Heterosexual males
- **I**: Circumcision
- **C**: Prevention of HIV infection

In pairs: Using your worksheet and remembering what was already discussed, identify MeSH terms for the concepts you would use in your search and write them down.
Identify concepts: MeSH

<table>
<thead>
<tr>
<th>Subject Headings</th>
<th>Concept #1: Circumcision</th>
<th>AND</th>
<th>Concept #2: HIV Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;Circumcision, Male&quot;[Mesh]</td>
<td></td>
<td>&quot;HIV Infections&quot;[Mesh]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OR</td>
<td>&quot;HIV&quot;[Mesh]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OR</td>
<td></td>
</tr>
</tbody>
</table>

Concept table with subject headings
Why textwords if we have identified subject headings?

1. Not all citations have subject headings, e.g., [PubMed - in process], [PubMed-not-MEDLINE]
2. Not all concepts have subject headings
3. Indexers are only human (they make mistakes)
4. Not all databases use subject headings
# Keyword vs. Subject Heading

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Subject Heading</th>
</tr>
</thead>
<tbody>
<tr>
<td>“natural language”</td>
<td>“controlled vocabulary”</td>
</tr>
<tr>
<td>Database will search <strong>multiple fields</strong></td>
<td>Database will search <strong>descriptor field</strong></td>
</tr>
<tr>
<td>May not be the <strong>focus</strong> of the article</td>
<td>Process involves humans, so results will be <strong>more relevant</strong></td>
</tr>
<tr>
<td>Does not take the <strong>meaning</strong> of the word into account</td>
<td><strong>Meaning</strong> of the word is considered ex. mouse (rodent) vs. mouse (computer mouse)</td>
</tr>
<tr>
<td>Can yield <strong>irrelevant</strong> results</td>
<td><strong>Standard list</strong> of terms defines related synonyms</td>
</tr>
<tr>
<td>Necessary if database does not have a controlled vocabulary, if subject heading does not exist for your term, or to retrieve records that have not yet been assigned subject headings</td>
<td>Different in each database</td>
</tr>
</tbody>
</table>
Exercise

P
Heterosexual males

C
Circumcision

O
Prevention of HIV infection

In pairs: Using your worksheet and what has already been discussed, identify textwords for the concepts you would use in your search and write them down.
<table>
<thead>
<tr>
<th>Subject Headings</th>
<th>Concept #1</th>
<th>OR</th>
<th>AND</th>
<th>Concept #2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Circumcision, Male”[Mesh]</td>
<td>OR</td>
<td>“HIV Infections”[Mesh]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OR</td>
<td>“HIV”[Mesh]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Text Words</td>
<td>Circumcis*[Title/Abstract]</td>
<td>OR</td>
<td>hiv*[Title/Abstract] OR human immunodeficiency virus*[Title/Abstract] OR human immunodeficiency virus*[Title/Abstract] OR human immunodeficiency virus*[Title/Abstract] OR human immunodeficiency virus*[Title/Abstract]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(consider including spelling mistakes)</td>
<td>OR</td>
<td>aids*[Title/Abstract] OR acquired immunodeficiency syndrome*[Title/Abstract] OR acquired immunodeficiency syndrome*[Title/Abstract] OR acquired immunodeficiency syndrome*[Title/Abstract] OR acquired immunodeficiency syndrome*[Title/Abstract]</td>
<td></td>
</tr>
</tbody>
</table>

Concept table with subject headings and text words, using truncation when appropriate

- Make sure truncation picks up all variants
- Do not combine truncation with quotations
- Do not alter subject headings
Run the final search: Procedure

- Start with your first concept
  – Search for the subject headings first
  – Then search text words
  – Combine these synonymous searches with OR using your search history
- Repeat for your second, third, and subsequent concepts
- Finally, combine result sets (ORed synonym sets) for your different concepts with AND
How to search

Concept 1
Search #1 =
Search #2 =
Search #3 =
Search #4 =

Search #5 = #1 OR #2 OR #3 OR #4

Concept 2
Search #6 =
Search #7 =
Search #8 =
Search #9 =

Search #10 = #6 OR #7 OR #8 OR #9

Search #11 = #5 AND #10

Results
Run the Search

PubMed Advanced Search Builder

Use the builder below to create your search

Edit

Builder

All Fields

AND

All Fields

Search or Add to history

History

There is no recent history
Demo
Acceptable limits:

1. Date of publication
   - only studies conducted between 2000 and present (should have a good reason for a date limit though)

2. Publication language
   - only materials written in English or French (try to cover as many languages as your team can read)

Avoid using limits which will cut out studies that have not been indexed yet, e.g. humans, age groups
   - Do use neat tricks like x NOT (animals[mesh] NOT humans[mesh]) instead
Practice: Apply basic limits

Apply to your combined search result set:

> English & French Language
Apply filters if needed – Advanced

RCT hedge/filter/search strategy

▶ Usually database/platform-specific
▶ Copy and paste versions for PubMed or Ovid MEDLINE or Ovid Embase from the course guide: http://libraryguides.mcgill.ca/epib-619/rct-filters
▶ e.g., this one is designed for PubMed:

((randomized controlled trial[pt]) OR (controlled clinical trial[pt])) OR (randomized[Title/Abstract] OR randomised[Title/Abstract]) OR (placebo[Title/Abstract]) OR (drug therapy[sh]) OR (randomly[Title/Abstract]) OR (trial[Title/Abstract]) OR (groups[Title/Abstract])) NOT (animals[mh] NOT humans[mh])
### Example of a PubMed search

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Search</th>
<th>AND</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>#18</td>
<td>Add</td>
<td>Search (#16 AND #17)</td>
<td>AND</td>
<td>503 09:28:29</td>
</tr>
<tr>
<td>#17</td>
<td>Add</td>
<td>Search (English[Language] OR French[Language])</td>
<td>AND</td>
<td>23282122 09:28:21</td>
</tr>
<tr>
<td>#16</td>
<td>Add</td>
<td>Search (#14 AND #15)</td>
<td>AND</td>
<td>508 09:27:49</td>
</tr>
<tr>
<td>#15</td>
<td>Add</td>
<td>Search ((randomized controlled trial[pt] OR randomized[Title/Abstract]) OR randomized[Title/Abstract]) OR (placebo[Title/Abstract]) OR (drug therapy[sh]) OR (randomly[Title/Abstract] OR (trial[Title/Abstract]) OR (groups[Title/Abstract]) NOT (animals[mh] NOT humans[mh]))</td>
<td>AND</td>
<td>84679 09:27:27</td>
</tr>
<tr>
<td>#14</td>
<td>Add</td>
<td>Search (#8 AND #13)</td>
<td>AND</td>
<td>1697 09:26:49</td>
</tr>
<tr>
<td>#13</td>
<td>Add</td>
<td>Search (#9 OR #10 OR #11 OR #12)</td>
<td>AND</td>
<td>287049 09:24:51</td>
</tr>
<tr>
<td>#12</td>
<td>Add</td>
<td>Search aids[Title/Abstract] OR acquired immunodeficiency syndrome*[Title/Abstract] OR acquired immuno deficiency syndrome*[Title/Abstract] OR acquired immune deficiency syndrome*[Title/Abstract] OR acquired immunedeficiency syndrome*[Title/Abstract]</td>
<td>AND</td>
<td>88636 09:24:41</td>
</tr>
<tr>
<td>#11</td>
<td>Add</td>
<td>Search hiv[Title/Abstract] OR human immunodeficiency virus*[Title/Abstract] OR human immuno deficiency virus*[Title/Abstract] OR human immune deficiency virus*[Title/Abstract] OR human immunodeficiency virus*[Title/Abstract]</td>
<td>AND</td>
<td>250268 09:24:21</td>
</tr>
<tr>
<td>#10</td>
<td>Add</td>
<td>Search &quot;HIV&quot;[Mesh]</td>
<td>AND</td>
<td>6849 09:24:01</td>
</tr>
<tr>
<td>#9</td>
<td>Add</td>
<td>Search &quot;HIV Infections&quot;[Mesh]</td>
<td>AND</td>
<td>6849 09:24:01</td>
</tr>
<tr>
<td>#8</td>
<td>Add</td>
<td>Search (#6 OR #7)</td>
<td>AND</td>
<td>6849 09:24:01</td>
</tr>
<tr>
<td>#7</td>
<td>Add</td>
<td>Search Circumcis*[Title/Abstract]</td>
<td>AND</td>
<td>6849 09:24:01</td>
</tr>
<tr>
<td>#6</td>
<td>Add</td>
<td>Search &quot;Circumcision, Male&quot;[Mesh]</td>
<td>AND</td>
<td>6849 09:24:01</td>
</tr>
</tbody>
</table>

**#17 English or French**

**#15: RCT filter**

**#13: HIV concept set**

**#8: Circumcision concept set**
Export records to EndNote
To play it safe, have your EndNote library already open.

How to export >200 records from PubMed to EndNote:
http://screencast.com/t/wB6RccZCRKci
#7) Describe all information sources (e.g. databases with dates of coverage, contact with study authors to identify additional studies) in the search and **date last searched**.

#8) **Present full electronic search strategy** for at least one database, including any limits used, such that it could be repeated.

**Save a copy your PubMed search**

<table>
<thead>
<tr>
<th>Search</th>
<th>Add to builder</th>
<th>Query</th>
<th>Items found</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>#18</td>
<td>Add</td>
<td>Search (#16 AND #17)</td>
<td>503</td>
<td>09:28:29</td>
</tr>
<tr>
<td>#17</td>
<td>Add</td>
<td>Search (English[Language] OR French[Language])</td>
<td>23282122</td>
<td>09:28:21</td>
</tr>
<tr>
<td>#16</td>
<td>Add</td>
<td>Search (#14 AND #15)</td>
<td>508</td>
<td>09:27:49</td>
</tr>
<tr>
<td>#15</td>
<td>Add</td>
<td>Search ((randomized controlled trial[pt]) OR (controlled clinical trial[pt]) OR (randomized[Title/Abstract] OR randomised[Title/Abstract]) OR (placebo[Title/Abstract]) OR (drug therapy[sh]) OR (randomly[Title/Abstract]) OR (trial[Title/Abstract]) OR (groups[Title/Abstract]) NOT (animals[mh] NOT humans[mh])</td>
<td>3484679</td>
<td>09:27:27</td>
</tr>
<tr>
<td>#14</td>
<td>Add</td>
<td>Search (#8 AND #13)</td>
<td>1697</td>
<td>09:26:49</td>
</tr>
<tr>
<td>#13</td>
<td>Add</td>
<td>Search (#9 OR #10 OR #11 OR #12)</td>
<td>392095</td>
<td>09:26:27</td>
</tr>
<tr>
<td>#12</td>
<td>Add</td>
<td>Search aids[Title/Abstract] OR acquired immunodeficiency syndrome*[Title/Abstract] OR acquired immuno deficiency syndrome*[Title/Abstract] OR acquired immune deficiency syndrome*[Title/Abstract] OR acquired immunedeficiency syndrome*[Title/Abstract]</td>
<td>142086</td>
<td>09:25:51</td>
</tr>
<tr>
<td>#11</td>
<td>Add</td>
<td>Search hiv[Title/Abstract] OR human immunodeficiency virus*[Title/Abstract] OR human immuno deficiency virus*[Title/Abstract] OR human immunodeficiency virus*[Title/Abstract]</td>
<td>287049</td>
<td>09:24:58</td>
</tr>
<tr>
<td>#10</td>
<td>Add</td>
<td>Search &quot;HIV&quot;[Mesh]</td>
<td>88636</td>
<td>09:24:48</td>
</tr>
<tr>
<td>#9</td>
<td>Add</td>
<td>Search &quot;HIV Infections&quot;[Mesh]</td>
<td>250268</td>
<td>09:24:26</td>
</tr>
<tr>
<td>#8</td>
<td>Add</td>
<td>Search (#6 OR #7)</td>
<td>6849</td>
<td>09:24:08</td>
</tr>
<tr>
<td>#7</td>
<td>Add</td>
<td>Search Circumcis*[Title/Abstract]</td>
<td>5911</td>
<td>09:23:55</td>
</tr>
<tr>
<td>#6</td>
<td>Add</td>
<td>Search &quot;Circumcision, Male&quot;[Mesh]</td>
<td>4577</td>
<td>09:23:36</td>
</tr>
</tbody>
</table>
Search Embase on Ovid

- Retain as much of your original strategy as possible
- Recognize that subject headings will be different (or non-existent)
  - Embase uses subject headings from a controlled vocabulary called EMTREE
- Keep track of your search terms using a new worksheet
Search one database at a time to take advantage of subject headings.

Embase is one of many databases available on the Ovid platform.
Practice: Embase on Ovid

- Will be using training account during this session:
  - http://ovidsp.ovid.com
- Normally accessed through Library website
Export records to EndNote
To play it safe, have your EndNote library already open. In Ovid Online: Export in batches of <= 1000.
Save your Embase search

Select only a few records to avoid creating a huge Word document! The point here is not to save the records, it’s to document the search strategy

http://screencast.com/t/r98iRkZza86w
Save your searches for future use

▶ Create a My NCBI account in PubMed (free)
  ▶ Once your account is created, set up “Outside Tool” to display Find It McGill links in records when off campus: http://screencast.com/t/Em45ESRPC
  ▶ Allows you to save your search strategy, can be tough to edit later

▶ Create an Ovid Online account (McGill only)
  ▶ Access to “expert searches” which can be reused (e.g., modified Cochrane strategy for RCTs, filter for low and middle income countries)
  ▶ Allows you to save your search history, rerun it later, and edit it easily

You can also set up automatic alerts on saved searches!
See [SearchDocumentation.docx](#) for a reminder of the type of information you should be recording per PRISMA guidelines.
De-duplicate EndNote records

https://www.flickr.com/photos/fortcollinschiropractor/6169824610
Removing duplicates from EndNote

See the DeduplicatingInEndNote-20170509.docx file on DropBox

Lab 1 Searches and EndNote – Genevieve Gore

For more information, visit www.prisma-statement.org.
Questions?

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The guides available to you include:

**EPIB-619 Library Course Guide:**

**Health Sciences Information Starter Guide:**
http://libraryguides.mcgill.ca/healthscistarter/

**Systematic Reviews Wiki: A Guide to Library Resources at McGill:**
https://wikisites.mcgill.ca/systematicreview/

**Info on our Systematic Review Service:**
http://libraryguides.mcgill.ca/sysrevservice
Useful resources

  http://nnlm.gov/all_regions/files/advanced-pubmed-searching-resources-packet.doc

- Ovid Technologies, Inc. **OvidSP online training.**
  http://www.ovid.com/site/support/training.jsp

- U.S. National Library of Medicine. **PubMed tutorial.**


