INFORMATION SEARCH SKILLS IN SUPPORT OF EVIDENCE BASED PRACTICE

The practice of finding information to support evidence-based practice/medicine (EBP/M) is typically based on six steps:

1. formulating a clear and answerable question;
   a. identify background questions
   b. develop concise search question (foreground question)
2. developing a search strategy
   a. create a search map based on your search (foreground) question
   b. identify your question type in order to build your evidence filter
   c. identify appropriate limits for your search
3. selecting the best databases available
4. executing the search strategy
5. review and refine the search
6. select articles and information that answers your question and move that information to a bibliographic management tool

This guide shows you how to complete those steps.

1) Formulating a Clear and Answerable Question

It is important you understand what you are looking for before you begin searching for your information

The following scenario reflects an unrefined search topic

A 60 year-old man has just come has been suffering from knee pain for the last 15 years. The pain has gradually gotten worse over time, although not crippling the level of discomfort has escalated. The patient is 20 kilos overweight. He has seen his family physician and he suspects that the patient may have osteoarthritis; this is confirmed by further tests. You have been working with the patient and he tells you that the physician is suggesting that he see an orthopedic surgeon to schedule surgery for his knees. You, however, feel that the patient might benefit from exercise and that surgery might not be necessary. In an effort to convince the patient’s family physician to also encourage this more conservative approach to the patient you decide to review the literature for articles to send to the physician so that he recommends your treatment plan.

a) First, identify any areas of your unrefined search topic where you might need more information in order to better understand that search topic. Select a resource that will give you that information, typically a text book or reliable web resource.

b) Next identify your precise and concise search topic. Use these steps to help you with this process:

   • Identify the main concepts from the scenario.
   • A good tool to identify the main concepts is to use the PICO method. PICO is a tool to that makes you identify specific concepts and it is acronym that stands for: Patient, Intervention, Comparison, Outcome; here is how it works with our scenario:
P = 60 year old with osteoarthritis in knees
I = Exercise
C = Surgery
O = Improved function

- Using the information in the PICO you can create a precise answerable question: “Is exercise effective in treating elderly patients with osteoarthritis of the knees?” You now have a precise question which make searching much easier

2) Creating a Search Strategy

Create a search strategy using a search map to identify the terms you need to search, the filters you need to focus your search to the best evidence, and the limits you need to apply to focus your results to better meet your criteria

a) Search Map Identifying the P and I First

<table>
<thead>
<tr>
<th>P</th>
<th>I</th>
<th>C</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoarthritis knee</td>
<td>Exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osteo-arthritis knee</td>
<td>Physical activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degenerative arthritis</td>
<td>Weight training</td>
<td></td>
<td></td>
</tr>
<tr>
<td>knee</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Typically only search the P and the I, this is what you are interested in (you identify the C and O in your search statement to give clarity to overall scope of your research)
- Think of logical synonyms to include in your search. This will capture articles on your topic that may have used other relevant terms than what you identified in your search statement.
- Select appropriate subject headings used in various databases and include them in your search (see appendix for description of subject headings and how they can be used in your search)

b) Identifying the Question Type in Order to Build the Correct Filter

Once you have the basic search map created identify what type of question you have, is it a therapy, diagnostic, prognostic or etiology question? Identifying the question type allows you to create or select the appropriate filter for your search to pull out that articles that are based on the strongest research. This is because each question type, also known as domain, identifies the specific research methodologies being used to prove or disprove the specific therapeutic, diagnostic, prognostic, or etiological method being used.

The following chart indicates the terms to use to build your filter for each question type.

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Randomized controlled trial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Clinical trial</td>
</tr>
<tr>
<td></td>
<td>Random*</td>
</tr>
</tbody>
</table>
| Diagnosis | Sensitivity AND specificity  
|           | Validity  
|           | Reliability  
|           | Predictive AND Value*  
| Prognosis | Incidence  
|           | Mortality  
|           | “Follow-up Studies”  
|           | Prognos*  
|           | Predict*  
| Etiology (harm) | “Cohort Studies”  
|           | Risk  
|           | Odds AND Ratio*  
|           | “Case-control Studies”  

- These are very basic filters, more complex filters can be created depending on the question and type of research being done, consult a librarian for further information  
- The asterisk (*) indicates a wildcard  
- AND indicates that you need to combine the terms using the AND operator  
- Quotation marks indicate that they should be used to search the words as a phrase

The type of question for research example above is therapy. A filter can be built (or selected) and added to the search map

<table>
<thead>
<tr>
<th>P</th>
<th>I</th>
<th>Filter</th>
</tr>
</thead>
</table>
| Osteoarthritis knee | Exercise | Randomized controlled trial  
| Osteo-arthritis knee | Physical activity | Clinical trial  
| Degenerative arthritis knee | Weight training | Random*  
|               |               | Double AND blind*  
|               |               | Placebo*  

c) Limits
Limits can be applied to the search to make a search more precise. Limits should only be applied at the end of the search. A good strategy is to add one limit at a time in order to avoid inadvertent removal of useful or helpful articles.

Typical limits include:

- Date ranges
- Language
- Age
- Publication Types

Limits added to the search map

<table>
<thead>
<tr>
<th>P</th>
<th>I</th>
<th>Filter</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoarthritis knee</td>
<td>Exercise</td>
<td>Randomized controlled trial</td>
<td>English</td>
</tr>
<tr>
<td>Osteo-arthritis knee</td>
<td>Physical activity</td>
<td>Clinical trial</td>
<td>Age</td>
</tr>
<tr>
<td>Degenerative arthritis knee</td>
<td>Weight training</td>
<td>Random*</td>
<td></td>
</tr>
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<td>Placebo*</td>
<td></td>
</tr>
</tbody>
</table>

3) Select Appropriate Databases

Subject specific databases work best for finding relevant articles for research topic. Database include:

- MEDLINE (PubMed or OVID)
- CINAHL – Cumulative Index of Nursing and Allied Health Literature
- PEDro – Physiotherapy Evidence Database
- SPORTDiscus – Sports and kinesiology database
- SCOPUS – multidisciplinary database
- EMBASE – medical database

4) Executing the Search Strategy
Execute your search precisely. This is possible because the subject specific databases have search histories which allow you to build a search piece by piece and then combine results in order to execute very complex searches.

- Search one concept at a time, i.e. search your P first and use OR (see appendix if you are new to the OR and AND Boolean operators for combining searches) to combine those terms
- Search your second concept, again using OR to combine your terms
- Combine your two concepts using AND
- Search your filter terms, use OR to combine these
- Combine the results of the filter with the results of combining of your P and I search
- Refine your search by adding limits to the search, but only if applicable.

5) Review and Refine Your Search

Review your search results. You can refine your search by broadening the scope, adding additional broader concepts, or narrowing it by removing concepts that are too broad or vague. This is easily accomplished if you have constructed your search by building it one concept at time (reflected in the search example above. The following example shows a narrower exercise concept just looking at weight training – no re-entry of terms was required.
Retrieve and Store Your Selected Articles

Select the articles that you wish to use and use bibliographic management software to store those articles for future use. Recommended software includes:

- Endnote (must be purchased)
- Endnote Online (free but limited features, enough though for student use)
- Menedely (free online tool)
- Zotero (free online tool)

See Citation Management Software Subject Guide for more information
Understand How Boolean Operators Work in Your Search

Boolean Operators are instructions that databases use to combine different terms. There are different Boolean Operators but the two most important are **OR** and **AND**.

**OR** is used to combine similar terms (synonyms) or ideas in order to expand an idea, that is capture all the possible ways to express the concept you are looking

**AND** is used to combine different concepts to focus a search to capture articles that contain all the concepts of your search

The following Venn diagrams shows how each operator works:

**OR** – captures all parts, including the intersecting areas, everything that will be captured by the search is shaded

![Venn Diagram for OR]

**AND** – only captures those areas that intersect, that is the area where all three elements are present, everything that will be captured by the search is shaded

![Venn Diagram for AND]
**Subject Headings**

Subject headings are descriptors that added to the record of an article to reflect the content of the article. They are more accurate and precise as they are applied consistently to articles from a controlled vocabulary, i.e. the subject heading “heart attack” will be used in some databases to describe articles that use heart attack or myocardial infarction – therefore using the subject heading in this case gets you all the articles regardless of which term is used.

- Not all databases have subject headings but those that do give the possibility of performing more accurate searches
- Subject headings in PubMed/MEDLINE are called MESH
- Searches using subject headings can capture more relevant articles because they include variants of the subject
- Subject headings can be given one of two designations: major or minor. A major subject heading is used to describe the primary focus of an article. A minor subject heading is reflects a subject that is covered in an article whether it is major or minor
- Some databases require separate subject heading searches if you want to include them in your search and some databases will automatically include them based on the words or phrases you enter in the search.