Searching the literature for studies for a systematic review. Part 3: Using controlled vocabulary

Anne Littlewood[a] and Dimitrios Kloukos[b]
Manchester, UK, and Bern, Switzerland

Once a question has been broken down into searchable concepts and the databases have been selected, the next step is constructing the search strategy and formulating the search terms that will be used in the search. There are 2 main ways to search in most of the major medical bibliographic databases: via controlled vocabulary and via free text. Controlled vocabulary will be examined here, and then free text searching will be considered in a future article. The 2 methods of searching should be combined for a systematic review search.[1]

WHAT IS A CONTROLLED VOCABULARY?

A bibliographic record in a database like MEDLINE is made up of several elements, including title, author(s), journal name, volume, issue, page number(s), and abstract. In some databases, indexers may also add terms to each record to aid discovery. These standardized subject terms are drawn from a controlled vocabulary.[2] They are useful because they provide a way of retrieving articles that may use different words to describe the same concept. They can also provide information beyond what is contained in the words of the title and abstract. For example, if a researcher is interested in looking at acetaminophen for relieving pain, entering this as a controlled vocabulary term would retrieve articles that mention acetaminophen in the record, but also articles that mention its synonym paracetamol, even if acetaminophen is not directly mentioned anywhere in the article. Both MEDLINE and Embase operate controlled vocabularies. Medical Subject Headings, or MeSH, are used in MEDLINE and assigned by indexers who have read the full text of an article. They then "tag" the record in MEDLINE with the appropriate headings. In Embase, Emtree headings are assigned by machine. These 2 controlled vocabularies are very different, and a search designed using one controlled vocabulary will not work well in another database, so a search should be appropriately tailored.

HOW TO FIND THE MeSH FOR A TOPIC

MeSH are arranged in a hierarchy or tree, with broader terms at the top and narrower terms at the bottom.

Here is an example of where "overbite" sits in the hierarchy:

Stomatognathic diseases

Tooth diseases

Malocclusion

Dental Occlusion, Traumatic
Malocclusion, Angle Class I
Malocclusion, Angle Class II

Overbite

Malocclusion, Angle Class III
Open Bite

In the MeSH tree, "Overbite" comes directly under the heading for "Malocclusion, Angle Class II." In turn, "Malocclusion, Angle Class II" comes below "Malocclusion," which is classified as a "Tooth disease," which forms part of the broader heading of "Stomatognathic diseases." If the term "Overbite" is entered in PubMed, and the instruction to search the MeSH is included, the search would retrieve all of the records that have been tagged with the MeSH term "Overbite," whether or not "overbite" is mentioned specifically in the article.

A useful feature of MeSH is that they can be "exploded" or focused, depending on how broad the search is to be. Using the example above, if the term "Malocclusion" will retrieve not only records tagged with the heading of malocclusion, but also all of the terms below it in the tree, ie, dental occlusion, traumatic;

[a]Cochrane Oral Health, University of Manchester, UK.
[b]Department of Orthodontics and Dentofacial Orthopedics, University of Bern, Bern, Switzerland.
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malocclusion, Angle Class I; malocclusion, Angle Class II; overbite; malocclusion, Angle Class III, and open bite. However, the search can also be focused on malocclusion only by not exploding the MeSH (see below). In this case, the search would retrieve only those records indexed with the term "malocclusion," and it would not retrieve the narrower terms.

Emtree works in a similar way, but the headings are generally broader and less granular, which tends to make the "exploding" feature a less powerful tool.[3]

There is an online MeSH browser that can help to identify the MeSH for a topic, and it is a good place to start when formulating an initial search strategy: https://meshb.nlm.nih.gov/search. Each concept from the search question can be entered to find the appropriate MeSH term.

Once the MeSH terms have been identified, they need to be added to the search in a format that can be read by MEDLINE, in whichever platform is used. In Ovid, the term followed by "/" is enough, and adding "exp" at the beginning will instruct MEDLINE's search engine to explode the term. In PubMed, adding [mhexp] for exploded terms or [mhnoexp] for a more focused search after the MeSH term will ensure that the MeSH search is performed as desired.

SUBHEADINGS

Controlled vocabulary terms can often be combined with subheadings, which can help to focus a search. These are recommended when a search is very broad, or concentrates on a very particular aspect of a condition or intervention.[4]

These subheadings are known as "qualifiers." A list of available qualifiers for each MeSH is available in the MeSH browser, under the "qualifiers" tab. These are coded as 2-letter terms that can be added to MeSH term. For example, SU stands for "surgery." Entering Malocclusion/su as a MeSH term would retrieve only those records that had been tagged as being about surgical interventions for malocclusions. Again, Embase operates a similar system, and subheadings can be added to Emtree terms.

TEXT MINING TOOLS

PubReMiner is a text mining tool that has been developed to help with formulating a search, and it can be particularly useful for identifying appropriate MeSH terms.[5] A basic query can be added (eg, malocclusion and surgery), and PubReMiner will then mine records from PubMed. The software will pull out various aspects that could help with developing the search. These include which journals the search terms most frequently occur in, the authors most often writing the articles, and which MeSH terms are used most frequently. This tool can identify other MeSH terms that might be helpful. It is available online, free of charge.

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