

## MODULE 3 – THE LITERATURE REVIEW

### LEARNING OBJECTIVES:

1. To understand what a literature review is and why it is important to both your research project(s) and evidence-based decision making. (*Section A*)
2. To understand how a properly formulated research question is related to an efficient literature review. (*Section B*)
3. To learn the various types of articles you might encounter during a literature search and evaluate their relevance to your research question. (*Section C*)
4. To be able to develop and carry out an effective literature review using a number of sources or databases. (*Sections D & E*)
5. To learn to screen and evaluate the results of your literature search. (*Section F*)

### Section A: What is a literature review and why is it important?

- Definition of a literature review (Fink, 2005)
- Reasons why a literature review might be needed
- In brief, good literature reviews lead to better research and evidence-based decision making/practice.

### Section B: The importance of formulating the right research question

- Since formulating a research question was the topic of the previous module, this section will focus on how it impacts on literature reviews
- A properly formulated research question (narrow & specific) leads to more refined, relevant search results (use graph to illustrate)
- Examples of broad & narrow research questions

### Section C: Types of research literature

- Briefly define/describe/discuss the basic types of literature often encountered in a literature review
- Include a definition of “grey literature” since the term comes up often and it may be encountered in some searches (e.g. using Google)

### Section D: Where to begin? Choosing the right database(s)

- Explain that there are numerous databases available, each with their own strengths (and, in some cases, weaknesses).
- Give examples of the most commonly used databases/search engines (use Roger’s PPT examples)
- Give some examples of when one might be chosen over another

### Review Questions – Part 1 (Sections A-D)

### Section E: Carrying out an effective search

- Appropriate choice and use of search terms (specificity, MeSH, etc)
- Boolean terms
- Examples

### Section F: Screening and evaluating the results

- Using practical and methodological screening to sort and evaluate search results
- Examples of practical filters (e.g. type of study, years published, cohort used, etc.)

### Review Questions – Part 2 (Sections E-F)

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### INTRODUCTION

Designed in collaboration between Memorial University's Discipline of Pediatrics and Discipline of Obstetrics and Gynecology, this module is part of a series of teaching modules designed to augment residents' learning of the basic aspects of medical research and to prepare residents for conducting their own research projects.

This module is about *the literature review*. Once you have chosen a research topic and drafted a specific question, it is important to determine what is already known. A literature review will also help you further refine your research question to ensure you are investigating a novel idea, to help you model your study on similar published studies, or modify your methods based on the best evidence available. Outside of research, literature reviews can keep your informed clinical decisions based on the best and most recent evidence available and thus is an important skill for clinicians to know. Understanding how to carry out an effective literature review is then a key skill that impacts both your research and clinical performance.

In this module, you will learn:

- What a literature review is and its role within a research project.
- How a well-defined research question can improve the effectiveness of a literature search.
- The steps to carrying out an effective literature review based on your research (or clinical) question.
- How to screen and evaluate the results of a literature review.

You will also start the process of carrying out a literature review for your own resident research project.

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### CASE STUDY

Jane is a second year pediatric resident at a large city hospital and has been working to choose a research project for some time. Jane and her supervisor, Dr. Tremblett, have a common interest in the treatment and management of pediatric stroke, so have been planning a study around that topic. After discussions with Dr. Tremblett, Jane knows that the local emergency and neurology departments diagnose and treat a relatively large number of ischemic strokes in children (considering its rarity). She also determined that most cases of ischemic stroke in children are treated, at least initially, with an anticoagulant. Based on this information and the lessons learned in Module 1, Jane has developed the following research question:

*Do symptoms of acute ischemic stroke improve more quickly following the oral administration of Coumadin (Warfarin), Aspirin (ASA) or Plavix (Clopidigrel) in children aged 6-12 years of age?*

However, Jane is not fully aware of how much research has already been carried out on this topic or which study design might be best. Dr. Tremblett suggests that she carry out a literature review in order to help answer those questions and move forward with her research proposal.

Jane has a topic and research question, but is uncertain where to start with a literature review. What does she do next?

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### SECTION A: WHAT IS A LITERATURE REVIEW AND WHY IS IT IMPORTANT?

*“A research **literature review** is a systematic, explicit and reproducible method for identifying, evaluating and synthesizing the existing body of completed and recorded work produced by researchers, scholars and practitioners” (Fink, 2005).*

What causes diabetes mellitus? Which antibiotic is best to treat bacterial meningitis? Do infants with umbilical hernia have a better prognosis with or without surgical intervention? Often, the answer to clinical questions like these can be answered with a literature review. In other cases, a literature review can reveal knowledge gaps and help direct researchers in finding those answers.

A literature review is an integral part of both good research and good clinical practice. When carried out properly, a literature review can:

- Build knowledge and keep you up-to-date on recent developments in your field.
- Provide specific information to inform evidence-based practice.
- Provide a wealth of background knowledge to inform your research project and/or justify your research plans. This is especially important when applying for funding or preparing your research for publication.
- Help focus and refine your research question.
- Identify the unique contribution your research will make and ensure you will not be replicating existing knowledge.
- Help develop critical analysis skills, which are important for evaluating research and identifying the best evidence available.

Simply put, good literature reviews lead to better research and evidence-based practice/decision making. *Regular reading and literature reviews should be part of your clinical practice. While the remainder of this teaching module will focus on the role that literature reviews play in **research**, much of the knowledge gained will help to search the scientific literature for the answers to clinical questions.*

A *research literature review* differs from other types of literature reviews in one important aspect: the intent of the review is to summarize the available literature surrounding your *specific* research topic. Therefore, the scope of the review itself is directly related to your research question.

It is also important to consider how much **time** you have and are able to commit to your literature review. Comprehensive or systematic reviews can be large and very time-consuming; they can even be seen as an independent research project. However, with a little practice and planning, more limited literature reviews can get you the range of knowledge that you need.

The six steps summarized below are key to carrying out an effective research literature review, and form the basis for the remainder of this module.

Six steps to conducting an efficient research literature review:

1. Formulate a research question
2. Select appropriate sources/databases

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3. Choose your search terms
4. Run your search
5. Screen and evaluate your search results
6. Synthesize the findings

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### SECTION B: THE IMPORTANCE OF FORMULATING THE RIGHT RESEARCH QUESTION

You learned about the elements of a good **research question** in the previous module (Module 1). Here, we will consider how a properly formulated research question influences your literature review and, in turn, how a good literature review can help focus and refine your research question.

As shown above, the first step in any literature review should be to formulate a research question. Using the **PICOT** structure described in the Module 1, it is important to develop a specific research question that clearly indicates the study **population, intervention, control** or **comparison** group, **outcome**, and **timeline**. Having a *narrow, specific* research question focuses your literature review, ensuring that the search results are more precise (fewer articles) and relevant (directly related to your research question) than would be possible with a broad question.

#### Example of a **broad** research question:

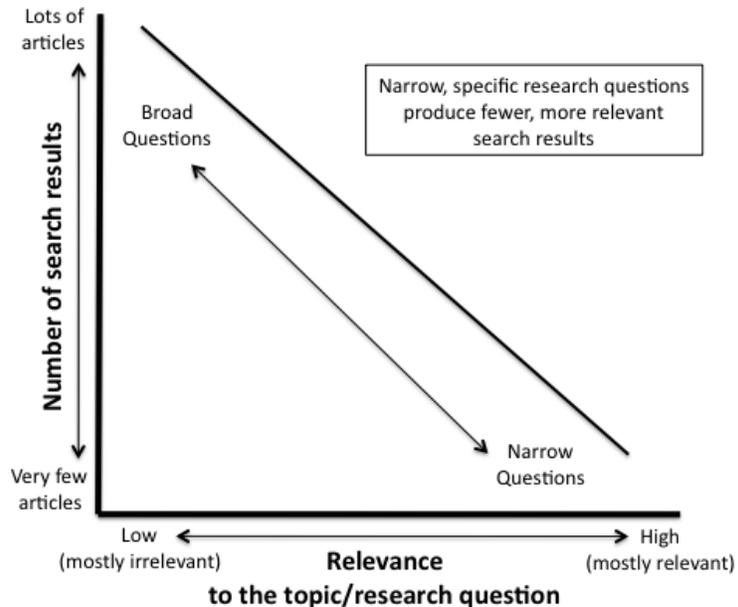
What is the prevalence of type 1 diabetes mellitus?

#### Example of a **narrow** research question:

What environmental factors are associated with type 1 diabetes mellitus in Canada?

#### Example of a **very narrow** research question:

Is the average exposure to UV solar radiation related to the prevalence of type 1 diabetes mellitus diagnosed in children under the age of fifteen in Newfoundland and Labrador during the past two decades?



Adapted from "How to Conduct a Literature Review" (Robin Featherstone, 2011)

While it is necessary to develop a good research question at the very onset of your project, it is also important to remember that it is an iterative process and your research question may change as you delve deeper into your research. A good literature review can help focus and refine your research question as more information on the topic is revealed. For example, you may want to adjust your study population, select a more specific intervention, or modify your methods to make your research more feasible and/or novel – all based on the evidence available. It may be that a similar study has been conducted somewhere else, so that you can model your study after that study to get comparable results. Revising your research question can be an important step in your research, and is another reason why a

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good literature review is valuable at this stage of the process. In general, broader research questions will lead to a wider pool of articles being

### SECTION C: TYPES OF RESEARCH LITERATURE

You can expect to encounter numerous different types of articles during your literature review. It is important to have an understanding of these different types of publications, the objectives and study designs that underlie them, and the different levels of evidence that each provide.

The bulk of the articles you will find during your search are usually single study publications. These are written to present and discuss the findings of a single study and may include a range of study designs from **basic science** to **clinical trials**. (You will learn more about the various study designs in Module 3.)

You may also find review papers written on topics related to your research question. These are comprehensive reviews undertaken to compare and summarize all the available literature on a topic and are peer-reviewed prior to publication. **Systematic reviews** are exhaustive (include all studies and papers), use explicit search strategies, assess the studies for methodological quality, and synthesize the findings to make important conclusions and recommendations. Depending on the purpose of your own literature review, you may find that recently published review papers provide an excellent tool to help you identify and summarize some of the information available about your topic. *However – it is important to remember that if a review paper includes a number of articles specifically about your research question then you should take time to reconsider the novelty of your planned research!*

While superficially similar, a **meta-analysis** extracts data from the body of literature, analyzes it collectively, and presents a “new” overall result or findings. Meta-analyses provide a broader determination of treatment effects and are therefore considered the best type of evidence available.

Depending on the search engine or database you use, you may also encounter **expert opinions** or editorials about your research topic. While these may have been published in a health journal, it is important to remember that these types of articles may not have been through the same thorough review process as the research or review articles described above. You may find such articles helpful and informative, but since they do not represent independent research they should not be directly cited in your literature review.

Finally, some search methods (especially using Google Scholar) may turn up informally published articles such as university theses and government/industry reports – collectively referred to as **grey literature**. While some grey literature may provide important facts or even independent research, it should be used with caution since much of it may not have been peer-reviewed and the quality is often uncertain.

**SECTION D: WHERE TO BEGIN? CHOOSING THE RIGHT DATABASE(S)**

There are a number of sources available to you for searching for research articles. Once you have developed a specific research question, it is important to select the most appropriate sources or databases. There are many available, and each have their strengths and weaknesses. General search engines (e.g. Google or Google Scholar) give a broader range of results, but also identify a lot of irrelevant articles and more grey literature. Medical databases may require more training in order to get proficient at searching, but also allow you to carry out more focused, specified searches.

**Examples of Commonly Used Databases**

**PubMed/Ovid (MEDLINE)**

- **MEDLINE** is a comprehensive database including “more than 20 million citations” from the fields of medicine, nursing, dentistry, veterinary medicine, the health care system, and pre-clinical sciences (maintained by the National Library of Medicine). **PubMed** provides an efficient interface to search the entire database. Other search engines, such as **Ovid**, also provide other avenues to search the MEDLINE database.

**Other medical databases (e.g. EMBASE / CINAHL)**

- There is a range of other databases and resources available, often related to specific fields or disciplines. For example, **EMBASE** is used primarily for pharmacological topics since it is designed to index and summarize drug-related adverse events and contraindications. **CINAHL** is an excellent resource for topics related to the fields of nursing and allied health.

**Google / Google Scholar**

- A free online engine that indexes scholarly literature across an array of disciplines and publishing formats. While the popularity of this database is increasing, it is important to remember that a large portion of the search results may be irrelevant, requiring significant screening by the researcher.

**Cochrane Library**

- A collection of (currently) more than 4000 reviews on the effects of health care and specific interventions, all carried out using a strict methodology and regularly updated.

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**Mobile Medical Resources (e.g. UpToDate / DynaMed)**

- Online, searchable resources to help physicians make evidence-based decisions and diagnoses. *These tools are designed for regular, case-specific use rather than comprehensive literature reviews.* Most are available as “apps”; some require a paid subscription while others are free.

\* More resources and a full list of databases are available from the library

Selecting the right database(s) for your literature review is important, and once again depends on your research question. While MEDLINE (PubMed or Ovid) is useful in the majority of cases, inclusion of other databases may have added value. For example, the Cochrane Library is especially important when your research topic includes a question about interventions. Each database uses their own search methodologies and often have

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different sources, but there is significant overlap. Comprehensive searches should use multiple databases, with search strategies tailored to each database.

### REVIEW QUESTIONS – PART 1

1. The purpose of a literature review has a significant impact on its scope and how the results will be used, so should be specified from the very beginning. For which of the following reasons is Jane carrying out her literature review? (Select all that apply)
  - a. **Build her knowledge about the research that has been published to date on her research topic.**  
*Yes. Since Jane is carrying out this literature review to prepare and plan for her own study, her main objective might be to do this.*
  - b. Help inform an evidence-based decision for a specific case.  
*No. In this situation, Jane is carrying out this literature review in preparation for a research project, not to help with a specific case.*
  - c. **Identify knowledge gaps and ensure that her research will contribute something new and informative to the field.**  
*Yes. In refining your research question and planning a study, it is important to confirm that you are in fact doing something novel and contributing something new. A literature review helps either confirm that or provide new direction.*
  - d. To evaluate the quality and validity of research that has been done to date on her research topic.  
*No. This would be the objective a systematic review – which is a much more onerous type of literature review and might be considered a research project on its own.*
  
2. Jane understands that her literature review will be most efficient if her research question is as specific as possible. Using the PICOT framework to review her question, she realizes one component is missing. Considering this, which of the following changes should she make?
  - a. Jane should be more specific about her study population.  
*No. Jane has already identified a very specific study population – children aged 6-12 that have suffered an ischemic stroke. Additionally, the age group she has identified matches the definition of “children” used by most medical databases (including MEDLINE), which will help make her literature review more efficient.*
  - b. Jane should be more specific about the interventions she will include in her study.  
*No. Jane has clearly identified three drugs that she would like to include in her research question. They are related (all anticoagulants) and she has determined that all three are routinely used in treatment of acute ischemic stroke in children.*
  - c. Jane needs to include a comparison group/population.  
*No. Jane has three comparison groups identified in her research question (children treated with three different anticoagulants). In this study design, she does not require a separate control group.*

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**d. Jane should specify a timeframe during which the treatment is/has been given.**

*Yes. Jane has not specified a timeframe in her research question. Doing so would help focus both the research project and literature review. (e.g. She might specify that the anticoagulant has to be administered within a certain number of hours after ischemic onset.)*

3. Jane knows that she will be very busy with clinical duties over the next few weeks, and will have limited time to carry out this literature review. As such, which choice of databases might be best – and why?

a. PubMed and Cochrane Library

*These are both relevant and useful choices, but the inclusion of one other database (see [c] below) might be useful in this case.*

b. PubMed, Ovid, and Cochrane Library

*While these are all valid and useful choices, this would not be the most efficient use of time since both PubMed and Ovid are tools that search the same database (MEDLINE) and the results may be very similar.*

**c. PubMed, Cochrane Library, and EMBASE**

*Yes. This would be the best choice. PubMed provides access to MEDLINE (the largest medical database available); the Cochrane Library (systematic reviews) would be useful since Jane's research question includes an intervention; and EMBASE would be useful since that intervention is pharmacological.*

d. PubMed and Google Scholar

*This would not be an efficient use of Jane's limited time since the Google Scholar search often include many irrelevant articles and grey literature and would require significant screening.*

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### SECTION E: CARRYING OUT AN EFFECTIVE SEARCH

Searching the medical literature is always a bit of work, but you get better at it and it gets easier with time. It is important to develop a good search strategy, which is an iterative process. It is essential to make your **search terms** as specific as possible (without excluding relevant literature). For example, a search for “*stroke*” will produce a mind-boggling number of results, while a search for “*stroke in children*” will produce a much smaller, more specific set of results. A similar search for “*cerebral ischemia in children*” will limit the results even further, eliminating articles about other forms of stroke that you may not be interested in (such as hemorrhagic).

A useful step is to break your research into concepts, then identify key terms or subject headings for each concept. Different databases use different subject headings, so tailoring your search terms to the database being used can be very helpful. For example, both PubMed and the Cochrane Library use **Medical Subject Headings (MeSH)** – a specific list of words and terms that it uses to index the literature. Some databases (e.g. CINAHL or EMBASE) use their own list of subject headings. Matching these terms to your own research question will help focus your search and produce the most relevant results.

Since PubMed is among the most-used resources in medical literature reviews, it is important to take a closer look at MeSH categories and how they can help you develop a good search strategy for your research question. MeSH categories are organized into branches, and generally presented with the more narrow terms indented under the broader terms.

<b>All MeSH Categories</b> <ul style="list-style-type: none"><li>• Diseases Category<ul style="list-style-type: none"><li>○ Respiratory Tract Diseases<ul style="list-style-type: none"><li>▪ Nose Diseases<ul style="list-style-type: none"><li>• <b>Epistaxis</b></li></ul></li></ul></li></ul></li></ul>	<b>All MeSH Categories</b> <ul style="list-style-type: none"><li>• Diseases Category<ul style="list-style-type: none"><li>○ Pathological Conditions, Signs and Symptoms<ul style="list-style-type: none"><li>▪ Pathologic Processes<ul style="list-style-type: none"><li>• Hemorrhage<ul style="list-style-type: none"><li>○ <b>Epistaxis</b></li></ul></li></ul></li></ul></li></ul></li></ul>
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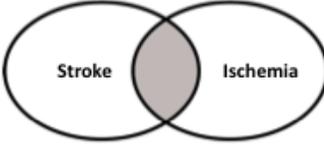
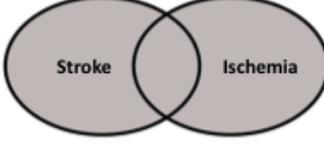
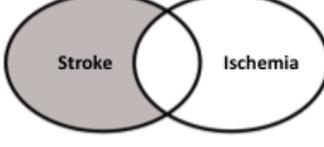
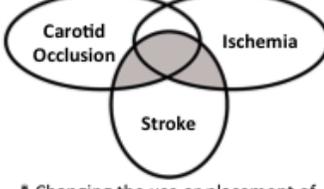
When you include a MeSH heading in your search terms, PubMed also searches the more specific terms beneath that heading in the MeSH hierarchy. This is known as the **explosion feature**.

You can also focus your literature search by using **fields** available in PubMed (and some other resources). For example, using the “publication date” field can help limit your search by providing only results that were published in a set time period, or the “language” field can eliminate all articles published in non-English journals. Other fields, such as “author” may be useful in helping you find a specific article or set of articles. In PubMed, fields can be typed directly into the search terms using bracketed codes (as shown below) or selected from a dropdown in the Advanced Search option.

<b>Examples of Search Fields Available in PubMed</b>	
[au] -- author—e.g., Smith J [au]	[pt] -- publication type—e.g., review [pt]
[dp] -- date published	[ta] -- journal title
[la] -- language	[ti] -- title words—e.g., epistaxis [ti]

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Using **Boolean operators**, such as “AND”, “OR”, or “NOT” in your search terms is another effective way to expand or limit your search. The relationships designated by these Boolean terms, and their combinations, can be illustrated using simple Venn diagrams as shown below.

Boolean Operator	Search Terms	Results (Illustration)	Results (Description)
AND	Stroke AND Ischemia		All citations on <u>both</u> stroke and ischemia
OR	Stroke OR Ischemia		All citations on stroke <u>plus</u> all citations on ischemia
NOT	Stroke NOT Ischemia		All citations on stroke <u>except</u> those also on ischemia
Combined Operators (Nested)	Stroke AND (Carotid Occlusion OR Ischemia)	 * Changing the use or placement of brackets will change the results.	All citations on stroke that <u>also</u> include carotid occlusion and/or ischemia

Adapted from Webster et al (2010), *Nephrology*.

It may take some practice to use Boolean terms appropriately (using the wrong combination or poorly placed brackets can produce interesting results!), but when used properly they are powerful tools.

Other search term operators may be useful in some databases. For example, using an asterisk (\*) can prompt a search with alternate endings to a word (e.g. including “*medic\**” will provide a set of results that include medicine, medical and medication). In Ovid, the term “.tw.” will search for a word only in the Title or Abstract fields (e.g. *ischemia.tw.*).

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### SECTION F: SCREENING AND EVALUATING THE RESULTS

The goal of a literature review is to identify articles that you are going to review. If there are a large number of articles, you can screen and evaluate your results in order to select a small number that are most relevant. You can do this by applying practical and/or methodological screening criteria to the results of each search:

- Use *practical screening criteria* to identify a range of potentially useful articles.
- Use *methodological screening criteria* to determine the highest quality studies and best evidence available.

Much of your practical screening can be applied at the onset, by adding **limits** directly to your search. For example, most databases and search engines provide fields that will allow you to search only for articles published within a certain time period or in a certain language. Other practical screening criteria applied after the search may allow you to limit your results to particular types of studies (e.g. review studies or clinical trials), or those carried out on a particular population (e.g. humans or children under the age of fifteen). Your choice of screening criteria will depend on your research question.

In most cases, you will now find yourself ready to review the articles you have selected. A useful approach to doing this is to apply the **PICOT** structure you used to evaluate your own research question – identify the specific **population, intervention, control or comparison** group, **outcome**, and **timeline** used in each study or article. While much of this information may be available in the abstract, it is important to read the rest of the article in order to find details about the methods and statistics used and the key results/findings. The Discussion is especially important since it places the main findings in context of other research and will help build your knowledge and understanding on the topic. It is helpful to keep written notes on your review of each article, summarizing all of the above.

In some cases, such as for a systematic review, you may also want to critique (rather than just summarize) an article. You can do this using methodological screening, which applies a much more rigorous set of criteria to your results. Questions, such as the examples below, can be used to evaluate the articles, identify the best studies or those that are most relevant to your particular research question:

- Is the study's research design and methods valid and appropriate?
- Are the sources/populations used in the study appropriate and reliable?
- Are the analytic and statistical methods valid?
- Are the findings and conclusions practical or meaningful?

Once you have adequately screened, evaluated and reviewed the results of your literature search, you can now synthesize your findings to meet your needs. For example, you may need to:

- Describe the current, up-to-date knowledge about your research topic.
- Identify knowledge gaps and/or support the need for further research - presumably the research you are proposing to carry out! (*This would be an integral part of a research proposal or grant application.*)
- Explain your research findings in the context of previous studies and existing knowledge (*e.g. the discussion section of a research publication.*)
- Describe the quality or overall evidence within a body of literature (*this is often one of the goals of a systematic review.*)

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### REVIEW QUESTIONS – PART 2

4. Jane is carrying out a search for relevant articles in PubMed. Which of the following search terms would be most useful? What is wrong (or less efficient) with the other terms listed?
- Children AND stroke  
*This search term is much too general, and would produce a large set of articles (8500+) on a wide range of topics including children and stroke. Jane could be much more specific and should include a term related to the treatments she is interested in.*
  - Anticoagulant AND stroke  
*Similarly, this search term is too general and would produce a large set of articles (8700+) pertaining to anticoagulants and stroke. In this case, it would be useful to specify the population of interest (i.e. children) to narrow the search.*
  - Children AND anticoagulant OR stroke  
*By using a combination of all three words above, Jane has correctly included terms about the disease/disorder, population and intervention she is interested in. However, she mistakenly used “OR” instead of “AND” in the second instance. Boolean operators are powerful tools but must you must be careful to use them properly. This search would result in more than 200,000 articles!*
  - Children AND anticoagulant AND stroke  
*This is more correct and would result in 296 articles that include reference to all three terms. However, since Jane is not interested in all types of stroke, she could be more specific.*
  - Children AND anticoagulant AND (ischemia NOT hemorrhage)**  
*Yes. By specifying that she is interested in ischemia but NOT hemorrhage (instead of the more blanket term “stroke” used above), Jane’s search will now produce just 136 articles that are more relevant to her research question.*
5. Using this set of terms, Jane’s search results in 136 articles. Although this is a relatively manageable number of articles, she decides to screen the results in light of her limited time. Which of the following limits can she place on her search using PubMed features? (Select all that apply)
- Published in the past ten years**  
*Yes. Using the Publication Date field available in PubMed, it is possible to search for articles published between any set of dates. FYI – adding this limit to the original search yields 66 articles.*
  - Sample size  
*No. Articles in PubMed/MEDLINE are not indexed according to sample size used in the study. If Jane is interested in this, she will have to evaluate the articles individually.*
  - Review articles**  
*Yes. Using the Publication Type field available in PubMed, it is possible to search for only Review articles (or other types, for that matter). FYI – adding this limit to the original search yields 28 review articles.*
  - Only articles that include the names of the drugs specified in her research question.**

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*Yes. You can build your search by adding multiple search terms in the Advanced Search option. FYI - Adding the original search terms and the term “clopidigrel OR acetylsalicylic acid OR coumadin” yields 26 articles.*

e. Best methodologies

*No. PubMed is unable to inform you about the specific methods used in a study or their quality. If Jane is interested in this, she will have to evaluate the articles individually. This is often a part of the review process used in systematic reviews, not so often in general literature reviews.*

6. Dr. Tremblett is pleased with Jane's progress and suggests they apply for funding from the hospital's research foundation to carry out their study. In what aspect does this change the way that Jane might use and synthesize the results of her literature review?

a. Jane should screen the results and determine how much research has been carried out on the use of anticoagulants in children with acute ischemic stroke.

*This is a basic goal of most literature reviews, and Jane should already have been planning to do this in preparation for her own project.*

b. Jane should synthesize the key findings of the studies to summarize what has already been found about the use of anticoagulant treatment in young stroke patients.

*This is a basic goal of most literature reviews, and Jane should already have been planning to do this in preparation for her own project.*

**c. Jane should use the results to identify a gap in the current knowledge and illustrate how her research will address that need.**

*Yes. While Jane may have done this to some degree in any case, this is especially important when preparing a project proposal or funding application since reviewers will want to know if the proposed research will contribute something novel and meaningful to the topic/literature.*

d. Jane should use strict methodological criteria to screen the results and evaluate the validity and quality of each study.

*This type of screening and evaluation is typically very time consuming and is usually part of a systematic review – which can be considered a project in its own right. This is above and beyond what Jane would be expected to do in this case.*

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### SUMMARY / RESIDENT WORKSHEET

Practice and experience are key to becoming proficient at literature reviews. In this module, we have examined what a literature review is, why it is important, how to choose the right resources, and key concepts in carrying out and evaluating your literature search. Now is a good time to put what you have learned into practice by designing and carrying out a literature review for your own research project.

1. Review the research question developed at the end of Module 1. Is it as narrow and specific as possible (use the PICOT framework)?
2. Consider the purpose and scope of your literature review. Why are you doing this literature review? How much information do you need and what specific question(s) are you hoping to answer? How much time are you able to commit to this review?
3. Which database(s) might be most appropriate for your literature review?
  - a. If your research question involves a specific intervention or diagnostic tool, are there systematic reviews available (e.g. Cochrane Library)?
  - b. Are there discipline-specific databases that might be relevant to your question (e.g. EMBASE for pharmacological treatments)?
  - c. If you have limited time and require only a general literature review, are there recent review articles available to help summarize the information available? (You can easily identify review articles in many databases, including PubMed.)
4. Choose your search terms.
  - a. Determine key concepts from your research question to help you identify important search terms.
  - b. When possible, use relevant terms or subject headings (e.g. MeSH in PubMed). These may differ between databases if you use more than one.
  - c. Use fields and limits available in the database to narrow your search when possible (e.g. to search for studies on a particular population, or identify review articles that might be helpful).
  - d. Consider how using Boolean or other search term operators might help narrow (or broaden) a search and make it more efficient.
5. Once you are satisfied that your search(es) have found the literature you need, consider how you might need to screen and/or evaluate those results. Perhaps you may be only interested in studies using a certain population (e.g. children under 15 years of age), specific treatments, or certain levels of evidence (e.g. clinical trials). Using these criteria to screen your results may help limit your results to a much more relevant and manageable body of literature.
6. Now it is time to sit back, do some reading and synthesize what you have found. How you do that will depend on the purpose of your literature review, as determined in Step 1 above (and discussed in Section F).

## MODULE 3 – THE LITERATURE REVIEW

### GLOSSARY

**Basic science** – Fundamental research that aims to develop or establish basic principles and information about a topic. In health sciences, the term is often used to encapsulate all forms of pre-clinical, lab-based research (e.g. molecular, genetic, or animal research).

**Boolean operators** – Terms (AND, OR, and NOT) that apply Boolean logic, a subset of algebra, to organize data into sets based on their relationship to one another. Boolean operators are especially useful when searching electronic databases such as those used for literature reviews.

**Clinical trials** – Research using clinical populations that generate safety and efficacy data for health interventions (e.g., drugs, diagnostics, devices, therapy protocols). Since they use human subjects, clinical trials are governed by a strict set of ethical guidelines and safety regulations.

**Expert opinions** – In medical literature, expert opinions are articles or editorials in which the author (usually a recognized expert in a given field) provides informed opinions on a specific topic or question.

**Explosion feature** – The process by which some search engines (including PubMed) include the more narrow terms in a hierarchical list when searching a database. For example, using the search term “diabetes mellitus” will prompt a search for that term as well as more specific terms such as “Type-1 diabetes mellitus”, “Type-2 diabetes mellitus”, “Gestational diabetes”, etc. (NOTE: This is an automatic feature in PubMed but can be turned off if desired.)

**Grey literature** - Informally published written material (such as reports, theses, etc.) that may be difficult to trace via conventional channels such as publishers. Much of this literature has not been peer-reviewed, so the quality may be uncertain.

**Literature review** - A process of identifying, evaluating and summarizing the literature relevant to a particular field or topic.

**Medical Subject Heading (MeSH)** – A controlled vocabulary and set of terms developed by the National Library of Medicine to index published articles within its MEDLINE database. It is used by PubMed and other search engines to search that database.

**Meta-analysis** - A systematic method that takes data from a number of independent studies and integrates them using statistical analysis.

**Research question(s)** - Questions which specifically ask what a study is aiming to discover. A research project can have more than one research question.

**Search terms** – A set of words or phrases used to search or query a database.

**Systematic review** – A detailed, structural analysis of previously conducted studies on a specific topic or research question. Systematic reviews generally attempt to summarize the existing research, identify the best available evidence and make overarching conclusions based on those findings.

## MODULE 3 – THE LITERATURE REVIEW

### REFERENCES / ADDITIONAL RESOURCES

#### Peer-reviewed publications

Jones LV, Smyth RL. [How to perform a literature search](#). *Current Paediatrics* **14** (2004) 482-488.

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Webster AC, Cross NB, Mitchell R, Craig JC. **How to get the most from the medical literature: Searching the medical literature effectively**. *Nephrology* **15** (2010) 12-19.

#### Online presentations

Featherstone R. **How to Conduct a Literature Review** (June 16, 2011)  
<http://www.slideshare.net/featherr/how-to-conduct-a-literature-review>

Georgia State University Library. **PubMed - Searching Medical Literature**  
<http://research.library.gsu.edu/pubmed>

University of California, San Francisco, School of Medicine. **Searching the Literature for Evidence-Based Medicine**  
[http://missinglink.ucsf.edu/lm/ebm\\_litsearch](http://missinglink.ucsf.edu/lm/ebm_litsearch)