

ABCS OF SYSTEMATIC REVIEWS

Stephan J. LaPointe, DPM, PhD

The objective of this article will be to introduce the reader to the definition of systematic reviews and provide a synopsis for how to perform one. We will start by defining some terms and discussing the traditional or narrative review since many of the concepts are shared and to start with a systematic review it is best practice to start with a traditional review. After reading this article, the reader should be more discerning when reading the podiatric medical literature. Hopefully this will generate some interest that may lead to more systematic reviews in the podiatric literature. All someone needs is the desire, a computer, and preferably at least one other person to help and another systematic review finds its way into our literature. In the world of evidence-based medicine, systematic reviews and meta-analysis play an important and critical role.

The majority of the content for this article can be found in the textbook by Jesson et al (1). This text combined with some examples in the literature would provide a good starting point for anyone wishing to undertake a literature review. The Cochrane Handbook for Systematic Reviews of Interventions is the definitive text available as both a hardcover or on electronic format for e-readers (2). This text is the gold standard and is itself a review that delves into the details of systematic review and is recommended as a reference. Two other texts by Gough et al, and Little et al were also used to formulate this article (3, 4).

What is a literature review? A literature review is a review of what research or data are already available on a certain topic of interest. A traditional literature review or narrative review is a free form search of the literature. The reviewer is free to search any or all sources of information on the topic of interest. The search strategy can change or evolve at any time. There is no requirement to record or report how the search was performed. There are different motivations for a traditional review. They include preparing to design an empirical research project, to provide the state of the art on a topic, as a research project in of itself usually at the masters level, as part of an expert review or as a stand-alone review of the literature, and as a scoping review to prepare for a systematic review.

Both traditional and systematic reviews share common elements. To search the literature we have to decide what literature should be involved and how to execute the search. This can include electronic searching of bibliographic

databases such as Medline/Pubmed, internet based searches via sources such as Google Scholar (<http://scholar.google.com>), and “grey literature” that may be found in PhD dissertations, conference proceedings or even unpublished findings that can be located by contacting experts in the field. Other sources include Scirus (www.Scirus.com) Scientific WebPlus (<http://scientific.thompsonwebplus.com>) and BioMed Central an open access publisher (www.biomedcentral.com). The best quality of data can be found in peer-reviewed journals. In the case of our profession we are fortunate that this can be found in Medline/Pubmed. However, for the purpose of systematic reviews it is strongly encouraged that all literature be searched including the grey literature, the sources listed above, and even reaching out to experts in the field to locate unpublished data. The purpose is it to avoid publication bias, which occurs when researchers elect not to publish reports that show no effect or when journals reject publication because of preexisting bias. This will skew systematic reviews to show an effect when indeed there may not be considered a Type I error.

To execute the search, we must become familiar with the literature available to us and the searching techniques. For the purposes of a medical search we must at the least become comfortable with the Pubmed search engine. The user should consider consulting with a librarian for methods on how to combine terms and maximize search results. Otherwise in the case of Pubmed there are learning tools and videos available on their website. During the scoping review, it is recommended to take note of the keywords that are attached to articles of interest and include them in searches going forward. Some bibliographic software such as EndNote allows the user to perform the search inside the software and automatically import the Medline article specifics including the abstracts. EndNote X6 now provides a web based approach so that the search results can be shared between users and note fields can be created making this an ideal approach when performing systematic reviews involving multiple reviewers. The Cocharane Collaboration has developed their own bibliographic software, RevMan, for all of their reviews and is free for academic use. It is wise to include the word “review” in your search early in the process to make sure the review has not already been performed.

If there is a review on the topic, this will make an

excellent starting point. Procure the full text article. Study the keywords, use that article's bibliography to see who the leading authors are, the types of articles, and their sources including the journals and dates, and hopefully there will be a description of the mechanics of the search process. These are all good starting points for a search. Otherwise, depending on the topic and search process you may get too many or two few hits and elect to modify the search criteria. The scoping review provides us with the breadth of knowledge and how best to search for the systematic review becomes more obvious.

Next the searches need to be reviewed. The title and the abstracts should be read for relevance and inclusion or exclusion. One must be careful since many article titles and abstracts do not properly reflect the content. Next the full text articles to be included are retrieved. There have been different approaches to reading the articles described. Articles should not be over or under read and critical thinking should be involved at all times. Many approaches to reviewing the literature have been espoused. One approach is to read the article three times by scanning first to get the overall position. Skimming and reading quickly is done on the second round, taking in main points while trying to determine if you should include it. The third time is when we get the details and extract the data needed for our writing the review. Another technique follows the acronym, EEECCA.

- Evaluate or analyze the topic from multiple points of view
- Evaluate or critique the topic to make a judgment about it
- Establish relationships and show how they are related
- Compare it to other literature
- Argue for or against it to see if you can make a persuasive argument

The last approach is espoused in many textbooks on the topic and follows the SQ3R acronym.

- Survey the text
- Question and look for answers
- Read carefully
- Recall and break it down into sections that involve the main ideas
- Review to make sure nothing was missed

While reading articles a two-part process is recommended. First is the study relevant to your question or purpose? If the answer is yes, continue reading. Otherwise the paper is excluded. Next does the article provide new

information not already uncovered or contribute in some meaningful way? If yes, continue reading. If no then just list it in the bibliography and go to the next paper.

During the reading process, notes are needed to recall relevant points and start to formulate the review. The reviewer should try to refrain from simply copying large sections of the original text. When making notes, it is recommended that a form be created for gathering the data. This should include but does not need to be limited to the reference data including the date of publication, when the note was created, the type of article (i.e., randomized controlled trial and key findings). You may want to add categories relevant to the topic so that you gather the data as you go along. It may be helpful to draw a diagram or flow chart showing how the articles are related and create folders for major topics whether paper or electronic.

Now that we have reviewed the search elements of a traditional review we need to take the next step and define the systematic review and contrast this with the former. The scoping review is done. The next step is to define the question and objectives of the systematic review. When developing the question, consider using the acronym PICO (population, intervention, context and outcomes). The intervention under investigation and any factors related to it, the population that will be addressed, what types of outcomes we are looking for and any context that may be applicable are all stated in the question to be clear at the outset.

The review protocol including what literature will be searched and how the search will be executed including keywords and all search terms is defined. Inclusion and exclusion criteria should be defined and a data extraction form designed a priori. The inclusion criteria should include the sources of literature; the date range included, languages included, and if there are other factors that would be necessary for inclusion such as type of articles included. The exclusion criteria may include any factors predefined to eliminate a source such as the date of the study, the location such as outside the US, etc. This is the equivalent of the methods section of an experiment or in this case the systematic review. Unlike the free form of the traditional review here there is a structured method that is laid out and transparent to the reader. It is possible to change the review process during the search, but the why, when and how must be included in an addendum to methods. The reader is provided the blue print of the search.

The next step is to perform the search. In a systematic review an effort should be made to search all the literature to eliminate publication and reviewer bias. A table should be created to show the search criteria used i.e., search terms, date of search, and results; typically the number of hits each search created. The title and abstract is screened and sometimes when possible the introduction and

conclusion. The reviewers must then cite and track how these criteria were applied and the results listed. This is the start to what is equivalent to the results section of an empirical experiment. This has the effect of creating a paper trail and continues our path to transparency. The articles that appear relevant and meet the inclusion criteria are printed for review.

An appraisal of the quality of the study or article is then performed. It is recommended that two reviewers rate the articles independently. When there is a disagreement, notes are compared and a conclusion is drawn, or a third reviewer may be brought in to resolve these issues. In the assessment of quantitative studies the study design is often used and a minimum threshold decided upon before the start of the appraisal. The hierarchy is listed below in order of strength.

- Systematic review and meta-analysis
- Randomized controlled trials
- Cohort studies
- Case-control studies
- Cross-sectional surveys
- Case reports
- Expert opinion
- Anecdotal

Then the studies should be reviewed on four dimensions. First the introduction is evaluated for why the study was undertaken, its context, and to determine the objectives of the study. Second the method as above is reviewed and sampling criteria are evaluated to see if they are valid and match the needs of the study and the review. Next the data are evaluated. Are the data shown? Are the data valid and reproducible? Lastly the analysis and results are rated. Is the analysis appropriate and does it answer the question? If the study found no difference, is the power of the study provided?

There are published reports on how to evaluate qualitative studies. Of these, the Consolidated Criteria for Reporting Qualitative Studies (COREQ) is a thirty-item list of critical elements in an attempt to sort out the quality issue. This list can serve as a starting point and items can be added or deleted as deemed appropriate for the purposes of the review. After reviewing several articles and applying the a priori criteria, new criteria may be required or that some are not appropriate. This may require changing the criteria and reapplying them to previously reviewed articles. Once again any decisions to change the protocol midstream should be documented providing the reason for the change and how the criteria were reapplied.

The results of the quality appraisal are two tables. One lists the articles that are included and why and the other those excluded and why. Often the citation, objectives, focus

or samples, methods, and reason for inclusion or exclusion are headings used and each line devoted to one study.

Data extraction and synthesizing the review is next. The above table serves as a starting point and additional notes previously taken combined with any connections, visual mapping of the concepts, flow charts, and when appropriate a timeline of how the data have evolved can be included in the write up. Again in the case of systematic reviews the note taking methods should be consistent over all studies and reviewers. It is important to be critical providing both the negatives and positives to avoid introducing bias. A good review does not just list the data in paragraph form. Ideally the synthesis is your intellectual contribution to the project that introduces new concepts or a different perspective that adds insight into the topic of interest. It should attempt to add value by interpreting the data and drawing new conclusions, updating the reader on what is the current level of knowledge and identifying what needs to be done or gaps in the current knowledge.

Although all reviews should add value, some researchers dismiss the traditional review in lieu of the systematic review. The systematic review is a more rigorous and structured search but really is still an extension of the traditional review. The traditional review is flexible; more subjective; can be done by one person; but lacks transparency; and is more likely to be biased if not comprehensive. Systematic reviews require an understanding of the topic and the literature, are more rigorous exhaustive reviews, have methods that are explicit and transparent, require more time and resources, should be done by more than one author, and are often restricted to peer-reviewed journals. In the case of systematic reviews of quantitative studies, if there are adequate data a statistical summary or meta-analysis can be performed. The latter is beyond the scope of this article. A search performed using the PubMed search engine using the keyword “systematic review” on the title limited to the *Journal of the American Podiatric Medical Association* and *Journal of Foot and Ankle Surgery* yielded twenty-two results. The same search was performed using the keyword “literature review” yielded 57 results. Certainly as the profession gets more sophisticated and critical of how we provide care in an era of evidence-based medicine our literature will see an increased number of systematic reviews.

REFERENCES

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