Pacific Rim International Journal of Nursing Research

The Final Four Steps in Conducting Systematic Reviews: It is Simple but Not That Easy

In the last issue of Pacific Rim International Journal of Nursing Research I wrote an editorial on the first four steps of conducting systematic review[1], that is, the steps of formulating the review question, defining inclusion and exclusion criteria, locating and selecting the study, and appraising the study's quality. In this issue I will describe the last four steps: extracting data, analyzing data, presenting results, and interpreting and making recommendation. But firstly, I would like to elaborate more about the importance of writing the protocol. As I have mentioned previously, the protocol should be identical with the review in terms of methodology once it is finished, that is, the reviewers need to follow the step indicated in the protocol completely without skipping or adjusting for any circumstance, so that bias is not attributed. The British Medical Journal in January 2015 published the article "Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation". I refer readers to this article which exclusively sets out 17 item-guidelines for reviewers to adhere to when developing or appraising a systematic review protocol.[2] The purpose of this guideline is to try to ensure that a review has no bias or has no any of conflict of interest. Furthermore, to prevent duplication of the review topic, reviewers need to register their topics and publish when the protocol is finalized. This can be done through the international register for prospective reviews (PROSPERO). The time line for developing the protocol generally is about 6 months, and then 6 months is recommended for completing the actual review. Systematic reviews should be updated when new evidence exists, and generally should be updated every two years.

Now onto the last four steps of undertaking a systematic review, I hope that this information will help to simplify the process for novice reviewers.

Extracting data

This step is similar to the data collection in the primary research. Once the reviewers finish critical appraisal of all studies retrieved and make decisions for inclusion in the review, the next step, is the extraction of the important information from the primary study. Standardized tools need to be utilized to make sure that all relevant information is retrieved and that this has been done identically by individual reviewers. Standardized tools can be utilized and retrieved from organizations that dedicate themselves to systematic review such as the Joanna Briggs Institute (JBI)[3] and the Cochrane Collaborations.[4] Before extracting data, the reviewers should do a pilot test to make sure that all items from the extraction tools are understood the same way among them. This will help to ensure reliability in extraction. Therefore, training to use the extraction form is recommended before commencing the review. Nevertheless, difficulties reviewers might encounter when extracting data might be related to heterogeneity among populations, measurement tools, and interventions.

The extraction form will be different between types of evidence and research approaches. In quantitative evidence, different research designs/methods will need a different extraction tool, for example, the extraction tool for randomized controlled trials or experimental research studies will be different from those of a cohort study. However, the information generally needed to extract information includes sources, study methodologies, and

the outcome. The information related to sources includes the authors' name, the citation, and contact details. This is very important especially when the reviewers need to contact the authors for more information related to primary research. The study methods include the research design, participant information, and instruments used in the study. The statistics applied to the primary research need to be identified as well. This step is very important in that it will allow reviewers to double evaluate whether all information are congruent based on the design and method. A strong background of research design for qualitative or quantitative evidence and statistics for quantitative evidence will be helpful for doing this step. The participant information, including the number of participants/sample size, setting and diagnostic criteria, need to be extracted thoroughly as well as study instruments, intervention and all outcome measurements. The frequency and intensity of the intervention needs to be specified. For those who conduct systematic reviews for qualitative evidence, the phenomenon of interest needs to be extracted.

Next important the result of outcome needs to be extracted. For experimental research studies, reviewers need to extract the result from each group at specific time points. Reviewers need to make sure that they put the right result to the right time series if it is time series study. If they want to pool outcomes only after the intervention, they also need to make sure that the time period of measurement is the same among the primary studies. For example, to measure the overall effect of life skills, one primary study might measure the outcome at 12 weeks after intervention, another one at 24 weeks. The reviewers need to make sure to pool the result at the same period of time to compute the overall effect size. Also, the reviewers need to make sure that the outcome from each study is measured based on the same tools. For example, if the outcome is quality of life (QoL), the reviewers need to make sure this was measured by the same tool. The reviewers can make a sub-group based on the same tool within one variable outcome if applicable, for example, in this case reviewers might pool the QoL score that measured from QoL of WHO for 3 primary studies, and 2 studies when QoL was measured by other tools such as illness related to QoL measurements. Remember that we need at least two homogenous primary studies to pool the overall effective outcome. The key is that all evidence needs to be homogenous in terms of PICO/PICo. These are abbreviations for Population (P), Intervention (I), Comparator (C), and Outcome (O) for quantitative evidence, but for qualitative evidence PICo stands for population (P), phenomenon of Interest (I), and context (Co) when they are pooled and analyzed.

Analyzing data

After extracting data ready to be pooled for analysis, the reviewers need to make sure that all relevant data are homogenous in terms of PICO/PICo as previously described. This is because the aim of a systematic review is to pool the result of at least two homogenous primary research studies to make the cumulative effect size or effectiveness in terms of the quantitative evidence, or to aggregate the results together and synthesis statement in terms of qualitative evidence. Therefore, meta-analysis will be applied for quantitative evidence and meta-synthesis for the qualitative evidence.

Meta-analysis for quantitative data

For quantitative evidence for meta-analysis, the reviewers need to know what is the type of data outcome from the primary study, and whether it is dichotomous or continuous data, in order to choose the right statistical procedure to compute the cumulative results. Odds ratio (OR) or relative risk (RR) are recommended to calculate overall effect estimate for dichotomous data (yes/no; present/absent). If the result is close to 1 or equals 1, this means no difference between two groups. The weight mean difference is recommended to use for continuous data. The 0 is equal to no difference between the two groups. The confidence interval refers to how precise are the

findings. The lesser is more precise. However, the sample size generally impacts on the confidence interval; the larger sample size, the smaller the CI, the greater the power and confidence of estimate. Therefore, this is the advantage of systematic reviews because when we pool the studies together, the number of the sample will be increased, leading to a greater effect size and greater precision of the finding. In terms of doing meta-analysis for effectiveness, if the reviewers use software programs provided by well-known and recognized organizations, for example, MAStERI from JBI, and REVMAN from the Cochrane Collaboration, they need to know all elements of statistics for analysis and choose the right one before running the analysis. Beside statistical issues, based on the experiential learning, if reviewers use the software, the step of creating the outcome variable of the result is very important and could bring difficulty if doing this carelessly. The name of the outcome variable should be exactly the same among primary studies as the software cannot pool the result if there are different names. Using upper or lower case when naming variable as well as the decimal is very sensitive process, and one needs to double check this before running the analysis.

Meta-synthesis for qualitative data

For those who wish to conduct a systematic review of qualitative evidence, the meta-synthesis will be applied. It is tremendously helpful if you can use software developed to ease this process, such as QARI for evidence from qualitative study and NOTARI for the evidence from text or narrative study from JBI. As for the Cochrane Collaboration, they mostly focus on the effectiveness from the treatment/intervention trial; and they have not developed software for qualitative evidence just yet. The software will help you to aggregate the results, which is the text data not numerical data, (and normally quite large), as well as the creation of categories and making the statement synthesis. However, reviewers undertaking both meta-analysis and meta-synthesis need to be trained in the processes and software before commencing the review.

Presenting result

Presenting the results of a systematic review is an important step. After reviewers have done a review of primary studies, pooled them and analyzed the cumulative effect outcome or synthesized statements, they need to find an efficient way to present the results. Normally, tabulation and meta-viewgraphs are recommended to help the reader see the whole picture of the pooled results for quantitative evidence.

For the qualitative evidence, the result section should be informative but not too wordy to provide the broad picture and detail of the findings, categories, and synthesis statements. Remember that in doing a systematic review of qualitative evidence, the reviewer does not need to re-analyze the results from the primary research studies, but only to aggregate them. A flow diagram of how findings were formed into categories and how categories were synthesized into the synthesis statements needs to be presented logically. The detail of findings and illustrations/direct quotes should be attached in the appendix.

In the report, reviewers need to make sure that the readers understand all processes from the beginning to end of the review process. Templates of tables summarizing these processes have been developed by the Joanna Briggs Institute.[5] These templates can be utilized for each type of evidence.

Interpreting and making recommendations

The last but very important step is to interpret and make recommendations from the review. This is an ultimate goal of doing systematic reviews. The interpretation of results and making recommendations need to be both truthful and strong enough to make recommendation for practice, research, and policy making related to the review questions and objectives. In this section of the report, reviewers also need to address the limitations regarding the evidence or primary research; the soundness of the primary research study; any bias that might have occurred

in the studies as well as the review itself that relevant to the process of conducting systematic review, especially in the steps of locating/searching, selecting and appraising the evidence that might affect the creditability of the evidence and the review. Any conflict of interest among the reviewing team or organizational support needs to be addressed as well. This is to alert the reader to be considerate of all relevant biases that might effect to the truthfulness of the evidence before one moves forward to implement the evidence into practice. JBI also suggests that a grading of recommendations should be included in the systematic review report.[6] This will inform the reader about what is the level of evidence in terms of its feasibility, appropriateness, meaningfulness, and effectiveness.

In conclusion, the last four steps of the systematic review are important just as the first four steps previously addressed in my earlier editorial.[1] How evidence can drive practice or policy making is based on the credibility of the results after we pool homogenous studies and compute the cumulative effect or aggregate all findings and form synthesis statements. However, this depends on the robustness of the evidence that we get both from quantitative or qualitative primary studies. Sometimes a systematic review might end up with not enough evidence to make a conclusion that can lead to the recommendation for practice and policy decision-making.

I hope that my description of the 8-steps in doing systematic reviews can serve as basic approach for anyone who would like to start to do systematic review. Please review and learn about the appropriate software on the website of JBI or Cochrane collaborations, and undertake some training courses. Finally, I would like to state that the systematic review approach and its reports are the best resources for clinical practitioners, researchers, and policy makers when they need evidence back up their decision-making.

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