Systematic Review as A Research Design: A Brief Overview

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Abstract

Systematic reviews and meta-analyses are proliferating in medical literature. Systematic reviews are conducted widely in medical science to answer focused and specific clinical research questions. Researchers employ a predetermined, explicit and progressive systematic methodology to comprehensively search for, select, formally evaluate, analyze and cumulate the studies which gives results for stated research problem. Meta-analysis; a further statistical step of systematic review is the statistical pooling of the results of studies. Systematic reviews critically appraise and synthesize the best available evidences and findings to provide a conclusion statement in regards to a specific answerable research question. The fame of systematic review and its application are scarce in India especially in nursing science. This paper tries to simply draw basic steps and concepts of Systematic review, along with guidelines and core methodology to be adopted while doing a Systematic review.

Keywords: *Systematic review; Research methods; nursing research, EBN.*

Introduction

Systematic reviews (SR) and meta-analyses (MA) are an inevitable part of evidence-based medicine and evidence based practice, even though as a research designs its concepts are not easily comprehensible for researchers especially for young nursing researchers. Physicians, nurses and researchers read SR and MA very often to keep up to date with their concerned field of work. SR and MA are frequently used as a referring point for constructing clinical practice guidelines[1]. Systematic review is often misrepresented as review of literature. To be precise systematic review is a qualitative synthesis and presentation of results from already published studies to get a cumulative result; because of this powerful results SR and MA are given highest status in hierarch of evidences. SR and MA gather results from multiple studies which address a common research question and give a strong conclusion with clarity. In medical research SR and MA are frequently conducted globally but in nursing discipline they are reported very scarcely. This paper tries to portray systematic review and its steps as a research design.

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Steps in conducting a systematic review

Steps in conducting SR and MA are almost same in and around, but to be exact MA is a quantitative extension of SR, MA uses bit complex statistical procedures as well to cumulate results from various studies to give a pooled result.

Steps of SR[2] can be listed as;

1. Framing research question/Formulating research questionfor SR

2. Locatingand identifying relevant studies

3. Selection of studies and assessment of study quality

4. Data synthesis and presentation of results

Steps listed above are sorted after extensive literature search from various sources and guidelines published by Cochrane collaboration[2]; it can vary in different text books and published scientific articles.

1: Framing research questions for SR

The problems to be addressed by the SR should be specific, unambiguous and structured form of questions before beginning the review. The ultimate goal of a systematic review is to answer a specific research question. For example, a question might be: *'How effective is back massage in the treatment of insomnia?'* The research question can be specified by indicating exactly which population (P), intervention (I), and outcome is of interest (O)[3]. Sometimes the question may be more specific adding a comparison (C) and a time frame (T), making research question in PICOT format. Other formats like PICO and SPIDER are also used widely[4]. An example of a specific question is: *'Which dosage of Risperidone is most effective in reducing hallucinatory events and improving the functional recovery of a Schizophrenia client?*

· **Inclusion and exclusion criteria**

After formulation of a specific research question adequate points of inclusion and exclusion criteria need to be written. This is done to avoid any kind of bias and errors in selecting studies. Study inclusion can be based on PICOT/PICO/SPIDER format. Studies which are duplicated, without full text availability, abstracts only papers, which does not answers our research question will be excluded after the search of studies. The eligibility and exclusion of study details are usually depicted using PRISMA[5] flow chart which draws flow of information in systematic review and sometimes followed by a meta-analysis.

Example of inclusion and exclusion criteria;

· **Inclusion criteria**

1. All randomized controlled trials evaluating the efficacy of drug Risperidone.

2. Studies without any restriction on the basis of country, date, gender, age, language of publication.

· **Exclusion criteria**

1. Study of drug in non-human subjects.

2. Study of drug in small scale studies.

3. Study with data not reliably retrieved.

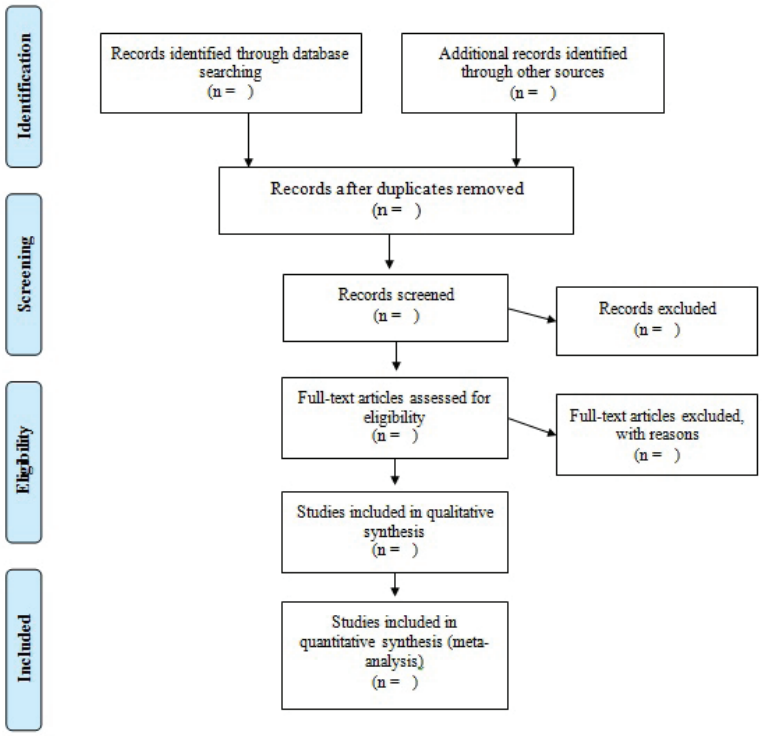

Figure 1: PRISMA flow chart[5]

2. Locating and identifying relevant studies

Extensive and comprehensive search for studies should be performed. Multiple resources (both computerized and printed) should be searched without any kind of language restrictions should be included primarily. The study inclusion criteria should flow directly from the review questions and be specified prior itself. Indications for inclusion and exclusion should be recorded and mentioned in flow chart[1].

3. Selection of studies and assessment of study quality

Various search engines and websites along with unpublished literature need to be searched. Several techniques including BOOLEAN operator searches are done to get maximum and optimal results. Pub-Med, Scopus, Web of Science, EMBASE, VHL, Cochrane collaboration website, Google Scholar, Clinicaltrials. gov, mRCTs, CINAHL, Conference papers index, Psych INFO, The Campbell Collaboration, POPLINE, and SIGLE are some of the prominent data bases which covers published articles from various disciplines globally. Studies located may be inculcated with wide range of biases. Inorder to avoid and filter such biases "The Cochrane Collaboration risk of bias assessment tool"[6] can be used for the appraisal of primary studies specifically for RCTs. Questions in the form of checklist to assess risk of biases are as follows;

- § Adequate sequence generation done?
- § Allocation concealment used?
- § Blinding done?
- § Concurrent therapies were similar?
- § Incomplete outcome data addressed?
- § Uniform and explicit outcome definitions?
- § Free of selective outcome reporting?

4. Data synthesis and presentation of results

Synthesis of collected data comprises of tabulation of study characteristics including year, author, sample size, quality and core results of study are written up[7]. The results are presented often in a table that clearly conveys the results.

Example of a SR results table

Table 1: Double blind randomized controlled clinical trials of Risperidone for adolescents with Hallucinations and irritability.

Study, Year	Patient Condition	Design	Sample size	Intervention	Main outcome	Adverse effects
X, 2020	Psychosis	RCT	630	Risperdal 2mg	Irritability	Itching
Y,2019	F20	RCT	526	Risp 2mg BD	Hallucination	Sleep disturbances

Readers can refer an article to grasp the structure of SR - *Ghanizadeh, Ahmad et al. "Aripiprazole for treating irritability in children & adolescents with autism: A systematic review." The Indian journal of medical research vol. 142,3 (2015): 269-75.*

Systematic review as a research design in Nursing

The research design systematic review comprises of a number of components as discussed above: Formulation of the specific research question, inclusion and exclusion criteria statements, performing comprehensive literature search from valid data sources, selection of articles included in the review, appraisal using evaluation checklist of the methodological quality of each study, data synthesis and analysis of collected data in the form of studies, and the formulation of conclusions for the

formulated research question. SR are not only to reviews in which the results of RCTz are summarized and synthesized, but also to reviews that summarize findings of non-experimental and descriptive studies or reviews looking on the value of a specific diagnostic test[8]. There are only few published articles using SR and MA as a research design when nursing is concerned, especially in India.

Problems encountered commonly while conducting SR

Heterogeneity and publication bias are two main problems in a systematic review. Heterogeneity as the term depicts the studies we locate are not adequately comparable in one or other form as some studies will be having varying paradigm in design, outcome and variables studied. This issue can be dealt by strict application of the inclusion and exclusion criteria's, it will be less in chance there is of heterogeneity, but the risk of ending up with no studies at all is also high and possible. Second problem is publication bias which occurs in the review because studies conducted globally are not been published throughout. It is generally came to a consensus that the risk of publication bias is greatest with regard to smaller studies in which no effects or even negative effects have been found, researchers often not prefer to publish studies resulting in negative outcomes is also a matter of concern[9].

Meta-Analysis and Systematic Review: Different; yet interconnected entities

Systematic reviews and meta-analyses are not entirely the same even both these terms are used synonymously and also in connection. Systematic review as I discussed above is comprehensive high-level synthesis of primary research on a specific research question that attempts to identify, select, synthesize, and appraise all high-quality evidence relevant to that question to answer it. Further, systematic reviews collate all evidence pertinent to previously selected eligibility criteriato address formulated research question. A meta-analysis on the other side clearly utilizes statistical methods (Not performed in systematic reviews) to evaluate pooled data quantitatively from selected individual research studies. Individual studies are given a weight based on the sample size. Conclusions are reported based on the accuracy and precision (Mean and confidence interval [CI] relative to a "zero effect" line on a forest plot) of individual research studies' results; however the flow of both research designs are more or less same except the analysis part and mode of reporting findings[10]. Every Meta analysis is preceded by a well conducted systematic review but every systematic review may not progress towards a Meta analysis.

Conclusion

With great rise of focus on formulating and suggesting guidance and recommendations for evidence based practice through systematic reviews, all medical/ nursing and other health care professionals need to grasp the principles, concepts and guidelines of preparing such systematic reviews. Some systematic reviews are followed by a meta-analysis which is a statistical extension of SR which is not warranted in all situations. Systematic reviews critically appraise and synthesize the best available evidences and findings to provide a conclusion statement in regards to a specific answerable research question.

Ethical Clearance: As it is a review paper no ethical concerns is encountered.

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Conflict of Interest: Nil.

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