Systematic Review Made Simple for Nurses *

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ABSTRACT

The increasing volume of healthcare articles and vast amount of information creates a need for a summary of the evidence in order to make informed decisions. Systematic reviews fulfil this need by providing comprehensive and unbiased summaries of research on a single topic. To equip nurses with the skills to conduct systematic reviews, a group of nurses were sponsored to the Joanna Briggs Institute in Adelaide, Australia. The paper aims to share with other nurses the process of reviewing quantitative and qualitative studies.

Keywords: critical appraisal, data extraction, meta-analysis, meta-synthesis, searching strategies

INTRODUCTION

Evidence-based practice in healthcare is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients[1]. It basically means integrating individual clinical expertise with the best available external clinical evidence from systematic research. In the Joanna Briggs Institute (JBI), "best practice" is fundamentally related to the identification of the best available evidence on the feasibility, appropriateness, meaningfulness and effectiveness of interventions and care practices[2]. When nursing practice is evidence-based, patients will receive nursing care that is safe, effective, promotes comfort and facilitates best outcomes.

It is important to ensure that this evidence is easily accessible to those who are involved in planning and implementing care to support the decisions they make in collaboration with patients, their families and members of the multidisciplinary team[3]. The increasing volume of healthcare articles and vast amount of information creates a more pressing need for a summary of all available evidence. Systematic reviews provide a means of having comprehensive and unbiased summaries of research on a single topic[4]. This allows healthcare professionals to rapidly keep abreast of the current information in specific clinical areas.

SYSTEMATIC REVIEW

Systematic review is an overview of primary studies, which contains a statement of objectives, materials and methods, and has been conducted according to explicit, transparent and reproducible methods[5]. Systematic review uses an explicit, valid protocol, which minimises bias and includes both qualitative and quantitative summaries. The Joanna Briggs Institute (JBI) evidence translation process involves: critical appraisal, extraction and a pooling of data[2]. A typical JBI evidence review protocol includes the following aspects[2].

Reviewers

At least two independent reviewers who have a good understanding of research designs are needed in a systematic review project with a third independent reviewer called in if there are differing of views.

Background

The background of the review describes the issue under review with a concise overview of the main issues but at the same time provides sufficient information to justify the conduct of the review and

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Table 1. Search strategy recommended by JBI[6].

Search Strategy		
Phase one	Initial search of literature	• Search Cochrane Library* for existing reviews. • Determine what databases should be searched • Become familiar with the topic • Identify key search terms for each database • Develop and document a search strategy
Phase two	Conduct search	• Search all databases using the identified search terms • Use inclusion criteria to determine which papers should be retrieved
Phase three	Bibliography search	• Search the reference lists and bibliographies of all papers for additional studies

* The Cochrane Library has a collection of databases that contain high-quality, independent evidence to inform healthcare decision-making. Cochrane reviews represent the highest level of evidence on which to base clinical treatment decisions. Cochrane databases of systematic reviews are accessible via SingHealth online library or www.cochrane.org.

the choice of the various elements such as interventions and outcomes.

Objectives

The review objectives must be stated in full, focus and make explicit what the reviewer intends to find out.

Review Questions

The review questions should be specific and focused, addressing the intervention, participants and outcomes; and provides the basis for the development of the inclusion criteria.

Inclusion Criteria

The inclusion criteria are criteria for considering studies for the review covering the study design, population, intervention and outcome. It will also list what is to be excluded in the review.

Search Strategy

The search strategy is a step-wise strategy to identify all relevant literature, which databases to be searched and search terms as well as identifying a time frame for this activity to be completed. The search strategy should be extended to unpublished studies. Search strategy recommended by JBI is outlined in Table 1.

Critical Appraisal

The process of selecting the suitable papers to be included should be transparent and reproducible. All papers selected for inclusion in a systematic review need to be subjected to rigorous appraisal. The aim is to combine good quality research papers. Critical appraisal is one of the most important steps in the systematic review process as it addresses the question of "should the study be included in the review?". If the quality of the research study is not established and included in the systematic review, the quality and outcome of the review will be affected. Combining results of poor quality research may lead to bias or misleading estimates of effectiveness.

Data Extraction

Tools used should be appropriate for the outcome of interest, and identified and documented in the review protocol.

Data collection tools are used to[6]:

- Ensure all relevant data is collected;
- Minimise the risk of transcription errors;
- Allow accuracy of data to be checked;
- Serve as a record of the data collected.

Data Synthesis

This will largely depend on the nature of the review, whether it is a meta-analysis or meta-synthesis (narrative summary of evidence).

All the stages of the review are described fully in the protocol and are subjected to peer review.

REVIEWING QUANTITATIVE PAPER

Traditionally, the dominant approach to systematic review of evidence favours the meta-analysis of the result of randomised controlled trials (RCTs). In fact, RCT is conceptualised as the "gold standard" in evidence of effectiveness, with other quantitative methods ranked as lower in quality in term of evidence[2].

Critical Appraisal

Critical appraisal aims to discover if the methods and thus the results of the research are valid[6]. The main aims of critical appraisal of effectiveness is to minimise bias (selection, performance and attrition bias). In critical appraisal that will eventually lead to the selection of good quality research papers to be included in the systematic review, 2 independent reviewers will undertake this vigorous process. And it is important that the reviewers have a good understanding of research design and use an agreed standardised checklist as a guide.

There are a variety of checklists available for the reviewer to decide inclusion or exclusion of a paper in the review. For example there are SIGN (Scottish Intercollegiate Guidelines Network) checklists and JBI has also developed a standard checklist to appraise RCT or experimental study designs. In Singapore, the Ministry of Health uses the SIGN checklist to appraise papers in formulating Clinical Practice Guidelines (CPG).

Data Extraction

The data for the systematic review is the results from individual studies. Before analysing the data, data needs to be extracted from the primary research. Strategies to minimise risk of error when extracting data are[2]:

- Utilise a standardised data extraction form;
- Pilot test extraction form prior to commencement of review;
- Train and assess data extractors to ensure consistency;
- 2 reviewers to extract data from each study independently to ensure reliability and accuracy;
- Blind extraction before conferring.

The data extraction forms will help to summarise the data, allowing the reviewer to enter these data into the software for meta-analysis.

Meta-analysis

Meta-analysis is defined as a statistical synthesis of the numerical results of several trials which all address the same question[2]. Meta-analysis is used to pool data from individual studies. When used appropriately, it provides a powerful tool for drawing conclusions from the data.

There are a series of software to facilitate systematic review. One commonly used software is REVMAN, developed by the Cochrane Collaboration*, and MAStARI by JBI (Meta Analysis of Statistics: Assessment and Review Instrument, currently in development). All are being designed to conduct a meta-analysis of the results of comparable randomised controlled trials, cohort, case control, time series and descriptive studies using a number of statistical approaches. Meta-analysis can only be used if studies have the same population, use the same intervention administered in the same way and measures the same outcomes.

In meta-analysis, odds ratio, weighted mean difference and confidence interval are calculated and used to interpret results of the combined studies.

The Odds Ratio (OR) is used when data is dichotomous e.g. the outcome is either yes or no/present or not present. The "OR=1" if there is no difference between groups.

Weighted mean difference (WMD) is calculated for Continuous data (e.g. weight, age). The "WMD=0" if there is no difference between the groups.

Confidence Interval (CI) is the range in which the real result lies, with a given degree of certainty. Usually a 95% CI is used. It can also be seen as how confident that the result is not due to chance.

The final result will be presented in a meta view graph or forest plot. Heterogeneity between combined results will be tested using Chi-square test.

* Cochrane Collaboration is an international non-profit and independent organisation, dedicated to producing up to date, accurate information about the effects of healthcare and readily available worldwide. It produces and disseminates systematic reviews of healthcare interventions and promotes the search for evidence in the form of clinical trials and other studies of interventions. Accessible online at http://www.cochrane.org.

REVIEWING QUALITATIVE PAPERS

While RCT is probably the "best" approach to generate evidence of effectiveness, health professionals are concerned with more than cause and effect questions, which is reflected in the wide range of research approaches utilised in the health field to generate knowledge for practice. There is growing awareness of the need to extend the boundaries in the type of research used to contribute to the evidence-based practices in healthcare. And the practice of evidence-based requires information to be obtained using a range of research methods, moving beyond the discipline of clinical epidemiology.

Systematic review in healthcare rarely includes data from qualitative studies. To manage qualitative data, JBI developed QARI (Quality Assessment and Review Instrument) as an attempt to recognise the results of non-quantitative research as legitimate evidence for healthcare practitioners. For quantitative data, the evidence of effectiveness is the most important. For qualitative study, the level of evidence is assigned based on the feasibility (practical and practicable), appropriateness (intervention fit with a situation) and meaningfulness (where intervention is positively experience by the patient) of the study[2].

QARI is designed to provide a systematic process mirroring that taken for systematic reviews of quantitative research yet being sensitive to the nature of qualitative data. It is designed as a web-based database and incorporates a critical appraisal scale, data extraction form, data synthesis and a reporting function. The processes involved in the review of qualitative data using QARI are:

Critical Appraisal

JBI developed a standardised 10 criteria checklist, which is extensively piloted and reviewed, for 2 independent reviewers to appraise the qualitative studies.

Data Extraction

The aim of data extraction for qualitative studies is to reduce the findings of many studies by summarising the methods, interventions used in the research as well as the outcomes and findings of the studies[2]. The transferring of data from the original paper is done by using an approved standardised QARI data extraction form. It is normally done by 2 independent reviewers. In qualitative review, findings are often presented in themes and metaphors. Specific findings and illustrations are extracted directly from the text and will be used in the review. After extracting the findings and illustrations, the reviewer will categorise the validity based on 3 levels of evidence: unequivocal, credible and unsupported.

Meta-synthesis

Meta-synthesis involves identifying findings, grouping findings into categories based on similarity in meaning and then grouping categories into synthesised findings, which then can be used as a basis for evidence-based practice. The most complex problem in synthesising textual data is agreeing on and communicating technique to compare the findings of each study. The 2 reviewers, before carrying out data synthesis, need to establish[2]:

- Own rules for setting up categories;
- How to assign findings to categories; and
- How to write narrative summaries for each category and develop into synthesised findings.

When synthesising the results of qualitative studies, differing research methods such as phenomenology*, ethnography* or grounded theory* can be mixed in a single synthesis[2]. This is because the synthesis is of findings and not data, which is the critical assumption of the QARI process.

CONDUCTING A SYSTEMATIC REVIEW

The process of conducting a review is difficult, laborious and time consuming. Each review will typically take more than a year to complete. To make sure that the review is completed as scheduled, a strict timeline has to be followed for each step.

The following is an example of a systematic review paper done by Mistiaen and Poot[9], from the Cochrane Database of Systematic Reviews. The review topic is "Telephone follow-up, initiated by a hospital-based

* Phenomenology is an approach to qualitative research involving the study of complex human experience as it is actually lived[8]. It is based on the belief that experience can be interpreted only by the individual who has lived it, and the meaning of that experience to the individual is relevant and important.

* Ethnography is an approach to qualitative research in which the experiences of a specific cultural group are studied[8]. It involves examining the attitudes, beliefs and behaviours of a sociological unit and the researcher immerses in the subjects' way of life to understand the cultural forces that shape the behaviours and feelings.

* Grounded theory is an approach to collecting and analysing data in qualitative research, with the goal of developing theories to explain observations and experiences[8].

health professional, for postdischarge problems in patients discharged from hospital to home (Review)". Certain important steps of conducting a systematic review will be highlighted using the example.

Title

The topic of the review may need to be rephrased a few times in order to give the review a clear direction. For the example chosen, the title "Telephone follow-up, initiated by a hospital-based health professional, for postdischarge problems in patients discharged from hospital to home (Review)" is concise and informative. It is also indicated that the report relates to a systematic review.

Defining Question

The question addressed by a review needs to be defined precisely as the reviewer eventually has to make a dichotomous decision whether the paper will be included or excluded in the review[5].

Referring to the example, one of their review questions is: "What are the effects of telephone follow-up initiated by a hospital-based health professional, on the psychological health (including uncertainty, anxiety, informational needs, mood, perceptions of coping, quality of life, social activity, satisfaction) of patients in the first 3 months post discharge, compared to usual care or other types of hospital follow-up?". It had covered the 4 components of a good review question[6,9]:

- The specific **populations** which are to be investigated — patients in the first 3 months postdischarge;
- The **intervention** being evaluated — telephone follow-up;
- The **comparison or control** under study — usual care or other type of hospital follow-up;
- The **outcome** of interest — psychological health of patients.

Search Process

The reviewer is required to report where the information came from and how it was processed. A thorough search of the appropriate databases needs to be done and other potential important sources needs to be explored.

The following is a suggested checklist of data sources by Greenhalgh[5]:

- Medline database;
- Cochrane controlled clinical trials register;
- Other medical and paramedical databases;
- Foreign language literature;
- "Grey literature" (theses, internal reports, non-peer reviewed journals);
- References (and references of references, etc) listed in primary sources;
- Other unpublished sources;
- Raw data from published trials.

Searching for suitable papers is a long and tedious process. It is mostly dependant on the availability of RCT, cohort studies, case series and other studies. To reduce publication bias, unpublished studies should be included. Finding unpublished studies is difficult too because by nature, there is generally no public record of their existence. Most often, reviewers may end up with a long list of references but the full texts are not available or they are unable to locate the studies. And most importantly, reviewers need to master good literature search skills in order to perform a comprehensive search on the chosen topic. In the example, Mistiaen and Poot[9] did not limit the search with regard to language or publication date. They searched through all the databases (Cochrane Consumers and Communication Review Group's Specialised Register, CETRAL, The Cochrane Library, PubMed, EMBASE, BiomedCentral, CINAHL and etc) that are relevant to their review title. Reasons for not using certain databases were explained.

Selecting Studies

Selecting and deciding which studies should be included also require that the reviewer have a good understanding on the fundamental principles of research designs and statistics that provide the most valid evidence. The reviewer has to describe the number of studies found and the process of filtering the studies for detailed appraisal. They have to make sure the process of searching and filtering is done by 2 or more people and the whole process is recorded and documented.

Mistiaen and Poot[9] searched through 16 databases, which yielded a total of 14,572 citations. And after

elimination of duplications, 12,140 citations were left for initial sifting. The initial sifting was done against the inclusion criteria based on the title and abstract, resulted in 340 potentially relevant references. The retrieved full texts of the 340 references were assessed against 6 inclusion criteria. This resulted in a total of 33 studies discussed in 40 papers.

Data Extraction

This phase is often complicated by issues like extracting the right data, incomplete reporting of study findings, large range of outcomes used to evaluate an intervention and different ways in which the data is being reported and presented. Thus, the reviewer needs to be trained on using the standard extraction tools. For the example, Mistiaen and Poot[9] developed a data extraction sheet (based on the Cochrane Consumers and Communication Review Group's data extraction template), pilot-tested it on 10 randomly selected included studies and refined it accordingly. One reviewer extracted the data from included studies and the second author checked the extracted data. Data extracted were based on the following areas: study population, study environment, study methods, intervention, co-interventions, control intervention, outcomes, results, conclusion and limitations of the study.

Critical Appraisal

When appraising a paper, the reviewer needs to look into areas like aims of the study, method used (randomisation, blinding and follow up), results (treatment effects, margin of errors), and validity of the results. Thus, healthcare professionals need more practices and experiences in research process, critical appraisal skills and analysing statistical results.

Mistiaen and Poot[9] assessed the methodological quality of the included studies using the criteria from the Cochrane Effective Practice and Organisation of Care Review Group. This list contains 7 criteria to evaluate randomised controlled trials and control clinical trials: concealment allocation, follow-up of professionals and patients, blinding, baseline measurement, reliable primary outcome measures and protection against contamination. Lastly, they grouped the studies into 3 categories: A (low risk of bias=all criteria met), B (moderate risk of bias=at least 4 of the criteria met) and C (high risk of bias=less than 4 of the criteria met).

When there is disagreement between the 2 reviewers, the reasons were explored and discussed until the reviewers reached an agreement.

Synthesis of Studies

Most often we need to seek help from a statistician to enter the relevant data to generate a forest plot. As meta-analysis can only be undertaken when studies address the same question, use the same population, administer the intervention in the similar manner and measure the same outcomes[6], thus, including the right study during the selection and appraisal phase is of paramount importance.

Mistiaen and Poot[9] grouped the studies in different ways, according to similarity of intervention, according to broad groups of patient populations (e.g. all cardiac patients, all surgery patients) and according to the outcomes measured. As Mistiaen and Poot found significant heterogeneity in intervention modalities, research populations, outcomes and measurement tools, they combined only the study results statistically where appropriate and with inspection of the tests for homogeneity. One example of heterogeneity in intervention was the frequency of telephone calls made to patients within a 3-month period after discharge varied from a single call to a series of 32 calls. Another difficulty they faced was the considerable clinical heterogeity in research samples due to the large variety in patient populations. Thus, it was made more difficult for them to pool results across studies. In addition, there was also insufficient description on the control intervention, mostly listed unhelpfully as "usual care". In fact, according to Mistiaen and Poot[9], most of the studies were of low methodological quality and have high risk of bias.

For data pooling, Mistiaen and Poot selected outcomes and patient categories for which data could be pooled quantitatively. Refer to Fig. 1 (overleaf) for 1 of the outcomes for a particular patient category. Pooling can only be considered if similar outcomes (anxiety) were measured in at least 2 studies in a similar patient group (patients with a cardiac condition or who had undergone cardiac surgery). For this example, 3 studies measured anxiety in cardiac patients. Anxiety was measured at a reasonably similar point in time, ranging from 4 to 8 weeks. The standard mean difference was used for the continuous data and confidence interval (CI) was set at 95%. Pooling showed a standard mean difference of -0.47 (95% CI -1.28 to 0.34), which means both approach (usual care or telephone follow up) are clinically equivalent. However, caution is needed in interpreting this result as Chi-square test demonstrated large statistical heterogeneity. Thus, there was inconclusive evidence about the effects of telephone follow-up.

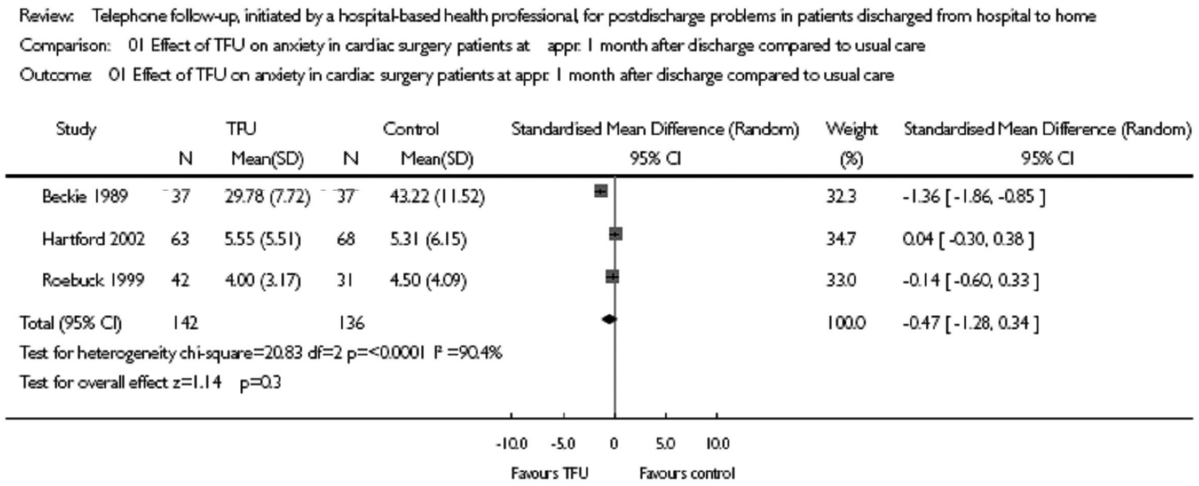

Fig. 1. Comparing the effect of telephone follows up on anxiety in cardiac surgery patients at approximately 1 month after discharge compared to usual care.

CONCLUSION

With the advent of systematic reviews, similar trials are grouped to provide a summary of effect estimate in improving the accessibility of information for busy clinician. Systematic reviews are certainly an advance compared to traditional literature review or "opinion" reviews that cite evidence selectively to support viewpoints[7].

Systematic reviews are the best available source of evidence to inform the development of clinical guidelines. However, critical appraisal of reports and cautious interpretation of results are essential to determine both methodological quality and external validity and hence the extrapolation of findings to clinical practice.

This paper focuses mainly on the approaches used by JBI. Alternative approaches used by Cochrane Collaboration are also commonly referred to by other reviewers. The Cochrane Handbook for Systematic Reviews of Interventions is available at http://www.cochrane.org/resources/handbook/.

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