



# Changing Practice

## Evidence Based Practice Information Sheets for Health Professionals

### An Introduction to Systematic Reviews

The series *Changing Practice* has been designed to support health professionals wishing to implement evidence based practice and to complement the Joanna Briggs Institute series *Best Practice*.

#### Why are Reviews Needed?

The need for evidence to support clinical practice has never been greater. This is the result of the vast array of available technologies, pharmaceutical and health care products. In addition the body of knowledge on which clinical practice is based, is changing rapidly. Clinicians must decide which interventions, products or technologies should be implemented, yet comparisons between products are often difficult because of limited information. Many of these health care products are also accompanied by sophisticated product promotion and claims of effectiveness.

Competition for health care resources has increased because of such things

#### This Sheet Covers the Following Concepts:

- Why are Reviews Needed?
- What are Systematic Reviews?
- Protocol
- Review Question
- Searching for Studies
- Selecting Studies
- Critical Appraisal
- Collecting the Data
- Summary & Synthesis of Studies
- Best Evidence

as the increased consumer expectations, aging population, and the demand for compensation when services fail to meet their obligations.

The knowledge on which nursing care is based is also changing rapidly and so some of what is taught to nursing students will remain relevant for only a small portion of their professional

#### Table 1 - Levels of Evidence

All studies were categorised according to the strength of the evidence based on the following classification system<sup>1</sup>.

**Level I** - Evidence obtained from a systematic review of all relevant randomised controlled trials.

**Level II** - Evidence obtained from at least one properly designed randomised controlled trial.

**Level III.1** - Evidence obtained from well designed controlled trials without randomisation.

**Level III.2** - Evidence obtained from well designed cohort or case control analytic studies preferably from more than one centre or research group.

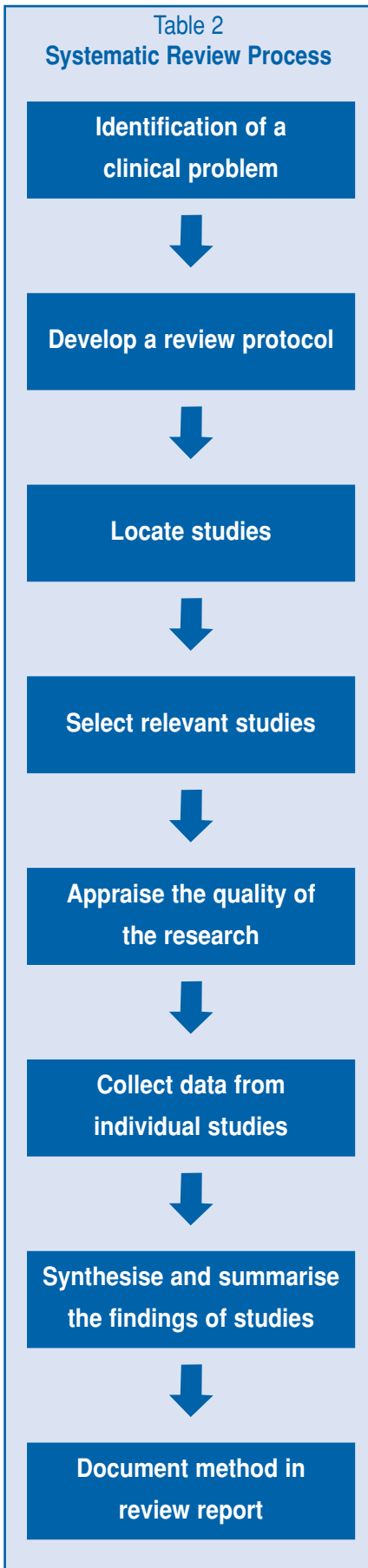
**Level III.3** - Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments.

**Level IV** - Opinion of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

career. However, assisting nurses to keep up to date with research, and transferring this research evidence into practice, has proven difficult.

Part of this problem is due to the massive growth in the available health care information. With up to 30,000 biomedical publications annually, and millions of citations listed in health care

Table 2  
Systematic Review Process



databases, the volume of literature is now too large for nurses to stay continually updated. Further, the quality of published research is highly variable. The use of inappropriate research methods, poor standard of statistical analysis or inadequate sample size often make research findings inconclusive or contradictory. This makes it difficult to know which studies should be used as the basis for clinical practice.

As a result, reviews have become an increasingly important means by which research results are collected, sorted, appraised and summarised. These reviews help overcome the problems associated with large numbers of published research and variations in quality between studies. While there are a range of approaches to reviewing research literature, properly conducted systematic reviews are seen to be the most reliable.

### What are Systematic Reviews?

Systematic reviews are summaries of all past research on a topic of interest. However, unlike the traditional approach to reviewing literature, they utilise the same principles and rigor that is expected of primary research. As the name suggests, they are systematic in their approach and use methods that are pre-planned and documented in a systematic review protocol. On completion of the review, the methods

used are documented in the review report, as is done with all primary research, to allow users the opportunity to appraise the quality of the systematic review. See table 2 for a summary of the steps in the systematic review process.

### Systematic Review Protocol

The systematic review protocol ensures that the review is conducted with the same rigour expected of all research. The protocol fulfils the same role as a research proposal as each step in the review process is fully described. The protocol states the review question(s), how studies will be located, appraised, selected and then synthesised.

### Review Question

Systematic reviews aim to answer specific questions, rather than present general summaries of the literature on a topic of interest. The questions addressed by these reviews are the same as those posed by the primary researcher. However, the difference is that primary research must exist on the topic to make conducting a review worthwhile. When evaluating the effectiveness of an intervention, a good review question should have four components:

1. the specific population which are to be investigated
2. the intervention being evaluated
3. the comparison or control under scrutiny
4. the outcome of interest

This question forms the basis for the development of the rest of the protocol, in that it gives the review a clear direction.

## Searching for Studies

A systematic search for research is one of the major differences between a traditional literature review and a systematic review. The aim is to identify as many studies on the topic of interest as is reasonably possible. To aid in this, a comprehensive search strategy is developed and documented in the review protocol prior to commencement. A strategy that increases in complexity is commonly used, starting with an initial search of major databases such as Medline and CINAHL using broad terms. This helps identify optimal search terms which are used to perform a comprehensive search of all relevant databases. Next a search is conducted of the reference lists of all retrieved papers to identify any additional studies missed during the database searches (see table 3).

Unpublished studies are also sought to help minimise the risk of publication bias. Publication bias results from the tendency that research showing a positive outcome is more likely to be accepted and published in journals than research that fails to demonstrate any benefit. Using only published studies may therefore overestimate the effect of the intervention. Unfortunately, finding unpublished studies is difficult because,

Phase	Activity	Tasks
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.

by their very nature, there is generally no public record of their existence. However, searches of databases such as those listing conference proceedings and higher degree dissertations may help uncover some of this research, as will contacting experts in the field. Finally, when possible, non-English language publications are also included in the systematic review, although the logistics of translating multiple research reports increases the complexity and cost of these reviews.

## Selecting Studies

Selection criteria are used to help determine which studies should be included in the systematic review, and these criteria are documented in the review protocol. These criteria document which population, intervention and outcome measures are of interest (see table 4). The optimal research design for answering the review question is also stated. For example, when the systematic review is evaluating the effectiveness of an intervention, the randomised controlled

trial (RCT) is considered to provide the most reliable evidence. However, if the review is concerned with other issues, such as the impact of an intervention on the recipients, other research methods may provide more relevant information.

Exclusion criteria should also be documented. Exclusions may relate to issues such as the exclusion of specific populations or outcome measures. The use of these criteria help protect the review from allegations of investigator bias, when the reviewer consciously or unconsciously selects studies for inclusion based on their results.

## Critical Appraisal

As part of the systematic review process, all studies to be included are first assessed for methodological rigor. Critical appraisal aims to discover if the methods, and therefore results of the research, are valid. The rigour of the research refers to the degree to which the design of the study and its conduct has minimised the risk of bias. When the critical appraisal is of RCTs, it aims to

identify sources of bias that may result from four stages of the research (see table 5):

1. selection of participants
2. treatment provided to the study groups
3. follow-up of participants
4. measurement of outcomes

The evidence generated by different research designs is also commonly ranked according to its strength. For example, the RCT provides the strongest evidence on the effectiveness of an intervention. See table 1 for an example of a scale that ranks the evidence on effectiveness generated by a range of different research designs.

## Collecting the Data

Data used by systematic reviews are the results from individual studies, which are collected with the aid of a data collection tool.

Data collection tools are used:

- to ensure all relevant data is collected
- to minimise the risk of transcription errors while data is being collected
- to allow the accuracy of data to be checked
- to serve as a record of the data collected

Although actual data to be collected varies with each review, it always relates to the review question. This phase of the review is complicated by issues such as incomplete reporting of study findings, the large range of outcomes commonly used to evaluate an intervention, and the different ways in which data are reported and presented.

For recently published research, it is sometimes possible to contact the authors to obtain missing data.

## Summary and Synthesis of Studies

The aim of this phase of the review is to synthesise the findings from individual studies in order to provide an overall estimate of the effectiveness of an intervention. However, it also allows the reviewer to investigate whether the effect of a treatment is roughly comparable in different studies, settings and participants. If the effect is not the same, this phase allows the reviewer to investigate the differences. The synthesis is achieved by a narrative summary of studies, or where appropriate, by statistically combining the data produced by individual

Table 4 Inclusion Criteria	
Population	What is the population of interest? • <i>adults with chemotherapy induced oral mucositis</i>
Intervention	What is the intervention of interest? • <i>mouth washes using a chlorhexidine solution</i>
Comparison	What is the comparison? • <i>mouthwashes using a saline solution</i>
Outcome Measures	What is the outcome of interest? • <i>the incidence and severity of oral mucositis</i>
Study Design	What research design will provide the most valid evidence? • <i>the randomised controlled trial</i>

Table 5 <b>Critical Appraisal</b>	
Allocation Bias	Bias caused by differences between treatment and control groups as a result of the processes used to select and allocate participants to the study groups.
Performance Bias	Bias caused by differences in the treatment of study participants other than the intervention being evaluated.
Attrition Bias	Bias as a result of differences between treatment and control groups in terms of losses of participants from the study.
Detection Bias	Bias as a result of how outcomes are measured for treatment and control groups.

studies. This pooling of data is termed meta-analysis. Meta-analysis provides a practical way of evaluating multiple studies. However, it can only be undertaken when studies address the same question, use the same population, administer the intervention in a similar manner and measure the same outcomes. When studies differ in one or more of these components, meta-analysis is not appropriate.

Meta-analysis involves transforming findings of individual studies into some common measure of treatment effect and then using conventional statistical procedures to determine if there is an overall effect. For outcomes measured on a dichotomous scale, such as the number of patients with an infection, common approaches include the use of the odds ratio or relative risk. For outcomes measured on a continuous scale, such as blood pressure or temperature, the weighted mean difference is commonly used.

However, there are many different methods by which results from individual studies can be combined during the meta-analysis. The results of the meta-analysis can be displayed graphically, making interpretation easier for users of the review. This graphical display also allows a visual comparison of the findings of individual studies.

### **Best Evidence**

Systematic reviews provide a summary of the best available evidence as a result of the methods described in this information sheet, . The risk of human error during the review is minimised by having two or more people undertake each activity. However, as a result of these processes, systematic reviews are time consuming and expensive endeavours. The end product is not only a summary of what we know about an intervention, it is also a summary of what further research is needed.



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# Summary of Systematic Review Process

<b>Problem</b>	Clinical problems are transformed into answerable questions.	Gives the review a clear focus.
<b>Protocol development</b>	Describes each phase of the review process.	Limits the number of subjective decisions that must be made during the review, also allows experts to comment on the proposed review.
<b>Identifying studies</b>	A systematic strategy is used to search for studies.	Increases the likelihood that all relevant studies will be identified.
<b>Critical appraisal</b>	The methodological quality of all studies is appraised before they are included in the review.	Ensures only rigorous studies are included in the review.
<b>Data collection</b>	Data is collected from individual studies with the aid of a data collection tool.	Minimises the risk of error during the transcribing of results from studies.
<b>Data synthesis</b>	Results are synthesised by either a narrative summary, and where appropriate, using meta-analysis.	Provides an estimate of the effect of an intervention.

## Reference

1. NHMRC, 1999, A guide to the development, implementation and evaluation of clinical practice guidelines, Canberra, NHMRC.

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