

Evidence-based practice tutorial: Systematic Reviews – a brief overview

Many osteopaths will have read or at least heard about the “systematic review of systematic reviews” published by Ernst and Canter (J. Royal Soc Med. 2006;99:192-196 at www.jrsm.org/cgi/content/full/99/4/192) which enjoyed extensive publicity in recent weeks. Many practitioners may have heard the term systematic review but have been unclear about what it actually meant.

What is a systematic review?

A systematic review is review of published literature prepared with a systematic approach to minimise biases (systematic errors) and random errors (simple mistakes). It includes information on materials and methods used in published literature; the search strategy and criteria for including trials should be transparent. A systematic review should, therefore, be reproducible and allow critical appraisal of the identified clinical trials. Randomised controlled trials (RCTs) are most commonly included but rarely information is included which is derived from other research designs, if appropriate. Systematic reviews are most frequently carried out to examine the effectiveness of interventions. Occasionally they can be used to examine questions that are not clinically based e.g. how many patients currently use complementary and alternative medicine). Questions for systematic reviews are often very narrow to limit the amount of suitable information gathered when searching for literature.

Why are systematic reviews produced?

The Department of Health commissioned a series of reviews on the effectiveness of treatments for common conditions to assist health care purchasers in the UK. They commissioned a consortium of the Universities of Leeds and York to provide rigorous and accessible reviews on the effectiveness of interventions for purchasers and initiated the Cochrane Centre at the University of Oxford to produce and maintain systematic reviews of the literature on health services.

How are systematic reviews prepared?

The findings of systematic reviews can be analysed in two ways.

- They can be summarised without statistical analysis (a narrative systematic review)
- Statistical techniques can be used to combine and summarise the results of studies addressing the same question (a meta-analysis).

A number of steps are normally followed in the preparation of a systematic review. These include:

Planning the review:

- i. Identifying the need for a review.*

It is important at this stage to identify systematic reviews that currently exist and those that may be in preparation. When currently existing reviews have been identified, they should be rigorously appraised for quality. This process is important to identify flaws in reviews that might

bias the results. A useful critical appraisal tool for systematic reviews can be found at www.phru.nhs.uk/casp/casp_s.review_tool.pdf.

- ii. *Preparing a proposal for a review.*
The research proposal should be based on an initial assessment of potentially available literature. This can be achieved by using clearly stated and reproducible search terms and named databases to scope the literature. Background information concerning the need for the review should also be included. Review questions, its methods, a timetable for completion, information about the reviewers and the strategy to disseminate the findings to a wider audience should be clearly stated.
- iii. *Developing a review protocol.*
This should be based on the findings detailed above. These should be developed to expand on the study selection criteria, a strategy for extracting data and methods of dealing with the extracted data.

Conducting a review:

- i. *Identification of research.*
A search strategy should be agreed. This should include identifying the electronic databases that will be used, looking at conference proceedings, grey literature and whether hand-searching will be used to examine non-electronic literature (e.g. old journals). The terms that will be included in the search can be generated using the PIOS format (i.e. Population, Intervention(s), Outcome and Study design). Synonyms can then be used to identify as many search terms as possible (e.g. low back pain patients, lumbar pain patients, spinal pain patients etc).
- ii. *Selection of studies.*
Clear inclusion and exclusion criteria should be agreed upon and once again this should be defined in terms of the PIOS format. Time (e.g. the past 5 years) and language restrictions can be imposed (e.g. English language papers only).
- iii. *Assessment of quality of studies.*
There are a number of different views concerning what constitutes quality in a paper. This can include the quality of the study methodology and the manner in which the study has been conducted and analysed. This is known as internal validity or the degree to which the results of a study are likely to bear closeness to the “truth”. The quality of the populations, interventions used (their description and homogeneity) and outcome measures must also be evaluated. This is termed external validity or the extent to which the effects observed in the study are able to be generalised to the population at large. An assessment of bias in literature is also important since this will tend to produce results that are becoming distanced from the “true” results.
- iv. *Extraction of data.*
This is the process by which the reviewers gather the information they require from the reports of the primary research studies. A data extraction form should be produced to introduce a consistency and systematic element to this procedure. The design of such a form should be undertaken carefully and should be directly related to the question(s) posed for the review. It should include some general information e.g. the name of the reviewer, bibliographic details of the paper and the source of the paper. More specific information on the form should include details of the

population characteristics, methodological quality of the study, interventions used and the outcomes used. Detailed information on the outcome of the study should include the number of drop-outs, length of follow up, missing data, information on discrete data (e.g. events, total numbers, p-values) and continuous data (e.g. mean, standard error, standard deviation, numbers and p-values) and effect measures. An example of a data extraction form can be found at www.jr2.ox.ac.uk/cochrane/pdfs/dataform.pdf.

v. *Progress monitoring.*

Periodic meetings can be held between the reviewers and the commissioners of the review to ensure that the work is progressing to a pre-agreed timescale.

vi. *Synthesis of data.*

This process involves the tabulation of the study characteristics and results to summarise the findings. A quantitative (numerical) evaluation of the results can then be carried out.

Reporting and dissemination:

i. *Preparing the report.* A report is prepared detailing the findings of the review. The dissemination strategy can then be implemented to make the findings available to as wide an audience as possible. Recommendations can then be made; these can be graded in terms of levels of evidence e.g. grade A is associated with high quality experimental findings without heterogeneity and with precise results.

ii. *Getting evidence into practice.*

The overall aim of any systematic review should be to improve the quality of health care and improve outcomes; this can only be achieved if relevant research findings are appropriately applied to practice. It should always be remembered that evidence based practice can be more appropriately described as “the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients, integrating individual clinical expertise with the best available external clinical evidence from systematic research”(Bury & Mead 1998).

What are the advantages of systematic reviews?

These can be summarised as follows:

- They are a less subjective assessment of literature than traditional literature reviews.
- The methods employed should be explicit and reproducible.
- Large amounts of information concerning a specific clinical question can be critically appraised and synthesised.
- The systematic nature of the method helps to prevent bias and simple mistakes occurring in the evaluation.

What are the disadvantages of systematic reviews?

These can be summarised as follows:

- Little assessment is sometimes given to the age, methodological quality, timing of outcome measurement, appropriateness of follow up period, competency of clinicians, competency of researchers, measurement tools used or heterogeneity of interventions used in the original trials.

- The interventions examined often fail to reflect current practice and are not graded for quality.
- Consideration is rarely given to the fact that interventions are delivered as part of a multi-modal package of care.
- The intended physiological effects of interventions are not considered.
- The questions posed are often too narrow.
- There may be insufficient numbers of high quality studies employing a particular methodology available for review.

Explanatory terms:

Heterogeneity. This is the degree of difference of variation between studies when examining key characteristics, methodological quality and effects.

Homogeneity. This is the degree to which studies in the review are similar.

Publication bias. This is a bias in the literature where the likelihood of publication of a study is influenced by the how significance its results appear to be.

Further sources of information:

York University Centre for Reviews and Dissemination:

www.york.ac.uk/inst/crd/index.htm

The Cochrane Library: www.cochrane.org

Cochrane reviews in complementary medicine:

http://news.cochrane.org/view/item/review_one.jsp?j=598

www.compmmed.umm.edu/Cochrane

www.Cochrane.org/consumers