

How to read an article

Peer Review

Most scientific journals are devoted to original articles that report advances in the discipline. The editorial board is established to ensure the quality of the published articles. Core journals in dentistry, medicine and most other disciplines use experts to assess the value of articles submitted for publication. With occasional exceptions this system works well to provide authors with advice about changes that will improve articles before they are published. Journals that don't use peer review are considered less reliable.

You should also note that most articles submitted to prestigious core journals are rejected, there just isn't enough room for them.

Quality articles

- 1 Examine important issues.
- 2 Are original, or make a significant review of the literature, or compare particular interventions for efficacy, or join studies together to increase the reliability of results.
- 3 Have a testable hypothesis.
- 4 Actually test the hypothesis.
- 5 Have an adequate sample size.
- 6 Have adequate controls.
- 7 Use an appropriate statistical analysis performed correctly.
- 8 Draw justified conclusions.
- 9 Are well written to be comprehensible.
- 10 Are written by authors who have no conflict of interests.

Most articles use the AIMRaD format

Abstract, Introduction, Methods, Results, and Discussion. There will be a list of references included at the end of the article.

Assessment of Articles

1 Aims

Why was the study done, and what hypotheses were tested?

This may determine whether you want to continue to assess the article or not

There should be short comments early in the abstract or introduction that makes clear the background of the articles and its aim. It's possible that such a statements might not appear until the first paragraph of the methods or even the discussion

Hypotheses

The hypothesis should be concise, specific and testable.

Null hypothesis

The null hypothesis is the contention that something tested will not produce any result beyond that expected by chance. Authors don't necessarily believe the null hypothesis, but set up a falsifiable hypothesis to test its validity

Other hypotheses

Evidence based practice articles usually have a statement of objective that asks if there is evidence of efficacy for a particular intervention.

2 Types of study

Primary studies report actual research such as

Laboratory experiments

These are usually test tube type experiments.

Animal experiments

These look at the effect of interventions on whole organisms. Animal experiments can often indicate whether human trials are warranted.

Trials

Phase I trials

Usually conducted on small numbers of healthy volunteers to look for adverse effects.

Phase II trials

These use small numbers of selected patients, or a series of patients often without a control group to test the outcome of an intervention.

Phase III trials

Large, long term trials on patients, usually with randomised control, double or single blinding, placebos etc. Patients in a RCT are randomly assigned to the treatment group, or the control group who either receive no treatment or a placebo. Both groups are followed for a set time and analysed for outcomes. On average the two groups should be identical except for differences produced by the treatment. Ideally RCTs should be double blind trials with neither the patients nor the researchers knowing who is receiving treatment.

Phase IV trials

These are usually post marketing trials on very large numbers of patients to gauge the long term safety and find rare adverse effects of interventions.

There are non randomised controlled trials conducted when random allocation is impossible, difficult, or unethical.

Observational Studies

Cross Sectional Surveys

These examine the study characteristic and the outcome at the same time. In looking at a diagnostic test a cross sectional study would be concerned to find such things as the number of patients with a condition who were not picked up by the test and the number of patients without the condition who were given false positive readings.

Cohort Study

Two or more groups are selected on the basis of their differing exposure to some agent such as an environmental pollutant, or an intervention. Groups are followed to measure whether subjects develop a particular disease or other outcome. Cohort studies often run for long periods because diseases such as cancer can take many years to develop.

Case Control Study

Patients with a particular disease are identified and matched with controls such as the general population, neighbours, relatives, etc. Data from the patients' past are then collected on exposure to agents that might cause the disease. Case control studies are usually appropriate in rare diseases where there are not enough patients for a cohort study.

Secondary Studies use the results of previous research.

(non systematic) Reviews

These are summaries of primary studies, often by 'experts'.

Systematic Reviews

These are articles that bring together all the objective studies on certain interventions for particular conditions. Sometimes authors do this to compare interventions, and sometimes to join study results to increase the size of the population tested (Meta analysis).

Clinical Practice Guidelines/Decision analyses

Should be evidence based serial statements to assist in diagnosis and treatment of particular conditions. These should not be based only on expert opinion.

3 Methods

You should spend most of your energy on examining the methods section of articles. It is you who will decide whether the article is useful in your practice. You must be convinced that the conclusions reached by the author(s) are valid being supported by the methods and the results.

Are the methods clearly defined?

Does this study add value to the literature?

Original studies usually do. Other studies that check the validity of earlier work, or add to the population tested may have value. Perhaps a later study was continued for longer, used a bigger or different population (gender, ethnicity age medical history etc), had a more rigorous methodology, or some other factor that contributes more.

Population

Is the population in the study sufficiently defined?

How were they recruited, and was there bias in this method?

What were the age, sex, ethnic, illness, and medication characteristics of the population in the study?

Who was excluded from the study?

Design

Is the experiment/intervention described in detail? Is the study design appropriate? Are there details of dose, frequency, follow up period etc? Are there details of what was given to any control group?

Diagnosis

Checking the validity and reliability of a new diagnostic test would best use a cross sectional survey in which both the new test and the current best test are performed.

Screening

Studies that check the value of tests for application on large populations should normally use a cross sectional survey method.

Therapy

Experiments that test drug treatments, surgery, patient education and other interventions are best tested using randomised controlled trials.

Prognosis

Preferred study design is longitudinal cohort study.

Causation

Determining whether an agent such as an environmental pollutant is related to illness.

Preferred study design is cohort or case control study depending on the rarity of the disease.

Outcomes

What outcomes were measured and how? Is there evidence that the outcomes are valid? Are the outcomes measured significant for the patients? Do the patients live longer, have better quality of life, get cured etc?

Objectivity

Bias is anything that can distort conclusions. These problems are usually associated with the differences in groups that are compared. The groups should be as much like each other as possible. You should make sure that the article you are reading gives sufficient detail of treatment and control groups to show they are the same except for the intervention.

Bias in Cohort studies

These usually can't produce similar groups. The researchers should use some sort of complex statistical analysis to adjust for baseline differences.

Bias in Case control studies

The major source of bias is whether an individual is a case or not. Articles on case control studies should detail how the diagnoses were made and their reliability.

Bias in Trials. Blind assessment

Doctors find what they expect to find. Clinicians are more likely to recheck an unexpected outcome if they know whether the patient is in the control or intervention group. To avoid bias studies should be double blind where possible.

Statistics

Preliminary Statistical Questions

1 *Was the sample size big enough for appropriate statistical analysis?*

In a trial the population tested should be big enough to be reasonably sure that if a worthwhile benefit of the intervention exists it will be found. A trial should be large enough to show if no benefit exists. Authors should complete a 'Power analysis' before beginning their study. This will tell them how many patients (etc) need to be tested to detect a clinically significant effect.

The chance of detecting a difference in the treatment group and the control should be 80 to 90%. An article describing a RCT should have a sentence or two that states that the authors ran a preliminary analysis to find the number of patients required for the trial. If the article doesn't tell you this detail you could do the calculation yourself.

2 What was the duration of follow up?

The study must be continued for long enough to see the effect of the intervention, and to see if the effect continues. The reasons patients drop out of clinical trials are often significant for the trial results. These can include

Death

Change of address

Clinical reasons (illness, pregnancy)

Loss of patient motivation

Adverse reactions (to placebo as well as intervention)

Incorrect entry of patients into the trial (patients didn't really fit the entry criteria).

All the patients in both the intervention and control groups should be included in the analysis whether they completed the trial or not. If dropouts are ignored this biases the trial.

Check in a basic statistics book to see if the tests used are standard for the sort of data collected. If authors have used an unusual test they should explain why, especially if the data collected is what you'd expect and the collection method isn't unusual.

You'll need to develop some basic statistical knowledge to make sure that you can tell when appropriate tests are used in an appropriate manner. You may on occasion need to consult an expert.

4 Conclusions

In this section the authors will interpret their results. Look at the language to see if the authors are confident of their interpretation. If they aren't should you be? Are the results consistent? Are the conclusions biologically sound? Is there a dose response relationship in the results? These are the questions that are important for interpreting results.

Can the results be extrapolated to other situations or other patients? Often the question for you to ask is Can I use this result for my patients?