Part 2: how to critique a manuscript

Introduction

Critical appraisal is a structured, focused approach for analysing research articles. It is a process of reviewing a paper to select the most valuable information and also involves asking a series of questions as a means of interrogation (Davies, 2000). These questions provide a framework and consistent method when reviewing medical literature.

The first article in this series discussed how to locate the relevant resources using the internet as the primary tool. This article will instruct the reader how to critically analyse a scientific or clinical manuscript.

Initial appraisal

Analysing the bibliography of the article can instantaneously help determine the usefulness of the paper. Bibliographic citations characteristically have three main components: author, title, and date.

Author

What are the author's credentials? Has their previous work been cited by other journals (you may either know this already if they are well known within their field, or this can be checked by searching on PubMed)? Is the author associated with a reputable institution or organization?

Title

The article title reflects how relevant the topic is for the desired reader. It is a guide to whether a paper is of interest.

Consider the journal title – is this a scholarly or a popular journal? Webster's third international dictionary (2006) defined scholarly as 'concerned with academic study, especially research.' Popular is defined as 'reflecting the taste and intelligence of the people at large'. This distinction is important because it indicates different levels of complexity in conveying ideas.

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Date

Is the source current or out-of-date for your topic? New research is being developed all the time and older practices may now have been replaced by more modern techniques (Cornell University Library, 2006).

Content analysis

Traditionally research papers follow the introduction, methods, results and discussion (IMRaD) format (Davies, 2001). The overall structure of the paper ensures a well-planned, clear and easy-to-follow article.

Introduction

This answers the question 'Why was it carried out?' The introduction introduces the area of study, indicating current knowledge, review of previous work and any disparity in current knowledge. This section should conclude with a clear sentence indicating the purpose of the study. The absence of such a statement can imply that the authors themselves have no clear idea of what they were trying to find out (Crombie, 1996).

Method

The method section provides the reader with a brief summary of the overall research model, e.g. retrospective or prospective, case report or survey. The description should be concise but still have sufficient information to indicate the source of study subjects, the nature of recruitment (e.g. age, named institute), data collected and which statistical methods were used in the analysis. Fundamentally, data should not be included in this section.

Results

The aim of this section is to provide an account of the research findings. Data should be presented in a logical way either in tables and figures or graphs. The key results should be highlighted. It is also worth checking whether the results fulfil the aims already addressed. Any findings not commented on should raise the questions 'Why was this missed?' Were findings unfavourable to the authors? The omission raises doubts about the whole paper (Crombie, 1996).

Furthermore the results section should not stray into scrutinizing or analysing the issues of significance or inference of the available data. This should be left to the discussion section.

Discussion

The fundamental question asked by health professionals when analysing an article is, should the relevant findings be acted upon and thereafter introduced into their current clinical practice.

The discussion section outlines the key points already touched upon and summarizes their significance. It is in this part the research is compared and contrasted to other published literature and any discrepancies addressed. The findings from a single study seldom provide convincing evidence. Thus the results from the study need to be interpreted in the light of previous reports (Crombie, 1996).

Are important results overlooked? Researchers have a tendency to focus their attention on findings that fit a preconceived notion. Data that contradict their views are sometimes ignored and not remarked upon further. Literature needs to be heavily scrutinized to ensure not only positively biased research is published.

Conclusion

This is the finale to the paper. It requires an easy to understand closing remark to conclude the paper. Any questions unanswered in the previous sections of the article must be resolved to ensure the paper's findings are not open to doubt.

The research design

The clinical question asked ultimately decides which research design is appropriate. This section provides an overview of the research methods available and discusses when and why they should be used.

Clinical trials

The aim of clinical research is to improve efficacy of existing treatments and interventions which are currently offered to individuals. Clinical trials test a particular hypothesis to assess the effectiveness of specific remedies, i.e. they compare one

treatment with another to seek the superior. They are often described in terms of testing medications, but they can be used to investigate many types of health-care intervention, for example, surgery vaccination and health education (Crombie, 1996).

Random allocation of patients to treatments is necesary for a fair evaluation. A randomized controlled trial (RCT) is a form of clinical trial and is widely considered the most reliable form of scientific evidence because it is the best known design for eliminating the variety of biases that regularly compromise the validity of medical research (Wikipedia, 2006). Placebo-controlled trials are used when assessing a new treatment as there are no other studies available for comparison.

The question of bias needs to be addressed. Triple blind studies involve all participants – patient, doctor and statistician – ensuring they are unaware of the clinical details. Knowledge of the treatment given may lead to biased results. In addition, ambiguous data may be disregarded by the author and therefore only positive outcomes recorded.

Cohort studies

A cohort study is a longitudinal analysis that follows patients for a set period of time to assess what becomes of them.

A prospective cohort defines the groups before the study is done, while a retrospective cohort can describe cohort studies which have identified a collection of patients after the data has been accumulated.

A cohort is a group of people who share a common characteristic. Cohort studies may have a comparison or control group. The comparison group may be the general population from which the cohort is drawn, or it may be another cohort of persons thought to have had little or no exposure to the substance under investigation (Wikipedia, 2006). A crucial question concerns the appropriateness of the control group: does it enable a fair comparison to be made? (Crombie, 1996).

It is essential when appraising cohort studies to allow for certain discrepancies over the passage of time. This includes aging, as disease frequency increases with age, and individual behaviour, e.g. diet, smoking and alcohol intake.

Case-control studies

Case-control studies are less-expensive epidemiological studies that can be carried out by small teams or individual researchers in single facilities. Often the group of individuals being evaluated will have some disease and questions will be directed to see if there are any defining characteristics present that differ from those who don't have the disease, e.g. women failing to attend routine breast screening are more likely to suffer from breast cancer.

A limitation of case-control studies is that of confounding. Confounding arises when an observed association between two variables is a result of the action of a third factor (Crombie, 1996). For example, the consumption of alcohol related to lung cancer. There is no evidence of a direct link between these two but both alcohol and lung cancer are related to smoking and tobacco use causes lung cancer.

Levels of evidence

Recommendation of a particular clinical service is classified by a strict balance of risk *vs* benefit of the service provided and furthermore the level of evidence on which this information is based. The Oxford Centre for Evidence-based Medicine (2001) uses this level of evidence and 'grades of recommendations' according to the research design performed and critical analysis of prevention, diagnosis, prognosis and management (*Table 1*).

Table 1. Level of evidence

Level of evidence	Example
1	Systematic review of randomized controlled trials
	High quality randomized controlled trial
2	Low quality randomized controlled trial
	Systematic review of cohort studies
	Cohort study or non-randomized controlled trial
3	Systematic review of case control studies
	Case-control study
4	Case series
	Low quality cohort study or non-randomized controlled trial
	Low quality case control study
5	Case reports
	Expert opinion without critical appraisal, based on physiology or bench research or 'first principles'

From Phillips et al (2001)

Conclusions

Critical appraisal is a structured way of reading research reports to assess their appropriateness, trustworthiness and implications (Cornell University Library, 2006).

Coherent presentation of the study including a stuctured, methodical layout ensures the reader understands the overview of the paper to the best of their ability.

It is vital the correct research design has been used, and it is the integration of good evidence combined with patient needs, facilitated by clinical expertise, that ensures that evidence-based practice can be implemented. BJHM

Conflict of interest: none.

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KEY POINTS

- Critically appraising an article provides a structured and methodical approach.
- Questions should be asked when reviewing any article to give a thorough evaluation.
- The various research designs discussed give a tailored approach for each individual design.
- It is essential that the correct research design is implemented to ensure evidence-based practice is carried out.