An Introduction to the Part A - Critical Appraisal Section (including example questions)

Introduction

This section is common to the specialties of Dental Public Health, Oral Medicine, Oral Surgery, Orthodontics, Paediatric Dentistry and Restorative Dentistry

The critical appraisal section will consist of a written examination lasting 3 hours. Candidates will be given reference material consisting of 3 extracts from published research and other scientific publications, 2 will be appropriate to their specialty and 1 will be a generic extract relevant to all specialties and sets of questions to which written answers are required. The purpose of this section is to test the knowledge and skills required for evidence-based practice, as outlined below:

- the concepts used in evidence-based dentistry including specificity and sensitivity, absolute risk and relative risk, hazard ratio, predictive value, number needed to treat, odds and odds ratio; grading of scientific evidence (*Concepts in evidence-based dentistry*).

- the most appropriate research designs to examine hypotheses; the limitations and strengths of research methodologies, including cross-sectional, prospective and retrospective observational studies, case series, case-control studies and cohort studies and randomised and non-randomised controlled trials, parallel groups, matched pair and cross-over designs; questionnaire design; quantitative and qualitative studies; use of techniques such as interviews, focus groups, transcripts of narrative material (*Study design*).

- basic statistical concepts, including prevalence and incidence, the representativeness of the sample, inclusion and exclusion criteria, sample size estimation, Type I and Type II errors, blinding, bias, confounding, confidence intervals, probability and correlation coefficients to enable interpretation of results from common statistical tests used for parametric data (e.g. t-tests, analysis of variance, multiple regression) and non-parametric data (e.g. chi squared, Mann-Whitney U) (*Basic statistical concepts*).

- the methodology of systematic reviews and meta-analyses, including the potential sources of bias and error in their interpretation (*Systematic reviews and meta-analyses*).

- issues relating to research results and conclusions including reliability, validity and generalisability (*Evaluation of research findings*).

Background Reading

Your specialist training will, of course, have made you familiar with the relevant scientific literature. In this examination you will be expected to demonstrate how well you understand the principles of scientific research (study design, statistical treatment, and presentation of results), and your ability to interpret scientific evidence and identify strengths and weaknesses in scientific papers.   These critical appraisal skills may be acquired by reading papers, textbooks or electronic media devoted to the subject or by attending courses. The following publications are recommended:

How to read a paper by Trisha Greenhalgh, a series of 11 articles in the British Medical Journal starting in volume 315 on page 180 (19 July 1997)

Further Statistics in Dentistry by Petrie, Bulman and Osborn, a series of 10 articles in the British Dental Journal starting in volume 193 on page 377 (7 October 2002).

Evidence Based Dentistry is an official publication of the British Dental Association, published four times a year since 1999 and available online. It 'selects from the biomedical literature those original and review articles whose results are most likely to be true and useful. These articles are summarised in value-added abstracts and commented on by experts.' It also carries a variety of articles on critical appraisal tools and lists forthcoming evidence-based courses and conferences. Further information is available from its website: www.nature.com/ebd.

The critical appraisal pages on the website for the Centre for Evidence-based Dentistry is a further useful source of reference: http://www.cebd.org/?o=1053. The two articles by Susan Sutherland are recommended:

1. *Evidence-based Dentistry: Part V. Critical Appraisal of the Dental Literature: Papers about Therapy - Susan E.Sutherland*
2. *Evidence-based Dentistry: Part VI. Critical Appraisal of the Dental Literature: Papers about Diagnosis, Etiology and Prognosis - Susan E.Sutherland*

They are available free and full text from the website.

Questions

The Critical Appraisal Section will comprise a number of question-sets. Example questions are provided here to give you an idea of what this Examination involves. The following examples are representative of the types of questions that candidates are likely to be asked in this section. For each extract provided in the examination, it is likely that between 4 - 10 questions will be asked: however this number may vary.

The list below is not exhaustive and actual questions posed in specific examinations may differ.

At the start of the examination you are strongly advised to read the questions before reading the abstracts: this will indicate to you the information you need to extract from the text. All questions should be attempted as marks will not be deducted for incorrect answers.

Example questions

- What research question did the authors study?

- What was the null hypothesis is this study?

- What type of study is this? What are the other main types of study design?

- Give the advantages and disadvantages of observational versus experimental designs.

- Give the advantages and disadvantages of prospective versus retrospective designs.

- What factors need to be taken into account in study design?

- Explain the basis of the Chi square test and explain why it was used in this study.

- Give the reasons for the exclusion criteria used in this study.

- Discuss the inclusion criteria used in the present study.

- Why is randomisation important in this study?

- Define the term 95% Confidence Interval and explain the significance of the CI in the present study.

- Explain Pearson correlation and what it demonstrates in the present study.

- What are Cohen's kappa statistics used for? What do the values presented in this paper indicate?

- What percentage of subjects either withdrew or were lost from the study? How may this influence the interpretation of the results?

- Explain the basis of the t test and explain why it was used in this study.

- Explain the basis of the Mann Whitney U test and explain why it was used in this study.

- What information is required to calculate the power of this study?

- Discuss how bias may influence the results in the present study.

- This paper describes a cross-sectional study. What are the advantages and disadvantages of this design?

- This study is a randomised controlled trial. What factors were considered during the study design?

- In relation to this randomised, controlled trial, is the method of randomisation adequate? Give reasons for your answer.

- What do you understand by the term 'intention to treat analysis'? Is this method used in the present study?

- What is the purpose of a power calculation?

- What are the possible consequences of omitting a power calculation?

- A kappa value of 0.83 for inter-examiner reproducibility is mentioned. What kappa value is generally considered to be satisfactory?

- For what type of data is the Chi-square test an appropriate test and why?

- What is a retrospective cohort study?

- State the advantages and disadvantages of a retrospective study.

- What type of study is a cohort study?

- Why was the endodontic specialist looking at the radiographs blinded to the outcomes of the root filled teeth?

- What is the purpose of blinding and explain the terms double and triple blinding?

- P=0.0004. What does this mean?

- Define the term 'the mean'.

- Define the term 'standard deviation'.

- Tests of inter-examiner and intra-examiner reliability are often performed in studies. Explain what these are and why it is important to do this.

- What are reliability coefficients?

- Is the Wilcoxon signed rank test a parametric test or a non-parametric test? Briefly describe how this test works.

- What steps do you have to go through to undertake a sample size calculation?

- The study was a randomised, controlled, parallel group, cluster clinical trial. What does this mean?

- The author described the steps taken to blind the study. Why is this necessary?

- The study received ethical approval. List <u>five</u> issues that the ethics committee would potentially have examined or considered in their approval of the study.

- In the materials and methods section the factors that should be considered in calculating the sample size are described. What are the study outcome measures? Discuss whether these are appropriate.

- We are told that the data were analysed on an 'intention-to-treat' basis. What does this mean and why is this important?

- What is the prospective study of a representative birth cohort?

- What is logistic regression analysis?

PLEASE NOTE THAT THE REFERENCE MATERIAL PROVIDED IN THE CRITICAL APPRAISAL SECTION WILL VARY IN COMPLEXITY, THE QUESTIONS ASKED WILL VARY IN DEGREE OF DIFFICULTY, AND THE PASS MARK WILL BE SET ACCORDINGLY.

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