How to Understand an Article

An Introduction to Interpreting Clinical Papers

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Objectives

- To understand the concept and process of 'critical appraisal'
- To identify different types of study designs
- To distinguish between different types of bias
- To critically appraise a real paper using a methodical framework

What is ‘critical appraisal’?

An assessment of the strengths and weaknesses of research methodology

What is ‘critical appraisal’?

- Examines **bias** (systematic error in individual studies that can lead to erroneous conclusions)
- Assesses the study’s validity
  - **Internal validity**: The extent to which the design and conduct of a study are likely to have prevented bias, and therefore, the results may be considered *reliable*.
  - **External validity**: The extent to which the results of a study might be expected to occur in other participants/settings (*generalisability*).

What is ‘critical appraisal’?

Methodology and results	Discussion and conclusion
Consideration of quantitative and qualitative aspects	Statistical analysis only
Balanced assessment of both the strengths and weaknesses	Negative dismissal of any piece of research

The value of critical appraisal

- Emphasis on intrinsic factors
- Structured agenda
- Challenges assumption
- Applicable to your own research and publications

Select the research design

Randomised Control Trial	Systematic Review	Cohort Study	Case Control Study
Case Series	Case Report	Cross-Sectional Study	Qualitative

New mothers who don't breast-feed are asked their views on breast-feeding

Children with a fever are given either paracetamol or ibuprofen to determine which is better at reducing the fever

50 young women with viral hepatitis and 50 young women without viral hepatitis were queried about recent ear-piercing to determine if ear piercing is a risk factor for viral hepatitis.

All the evidence on the effectiveness of clinical librarian services in supporting patient care is located, appraised and synthesised

An incidence of deficiency-related rickets in a set of twins aged 10 months is reported in an article

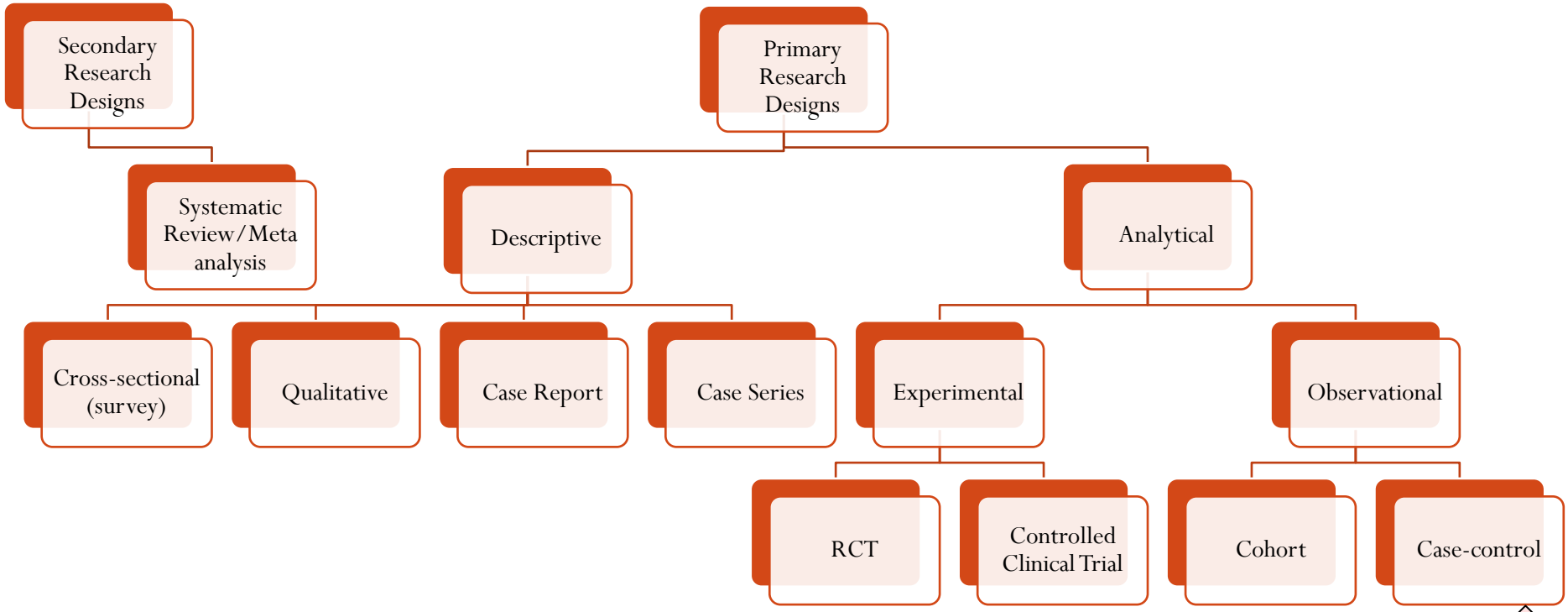
A large-scale population based questionnaire study examining the prevalence of stroke risk factors. Participants were surveyed once.

550 people who smoke cannabis are monitored over 15 years to determine whether they are at a higher risk of developing schizophrenia than people who do not smoke cannabis

An article describes the symptoms and clinical profile of 5 children who presented to an Emergency Department who were suspected to have abdominal epilepsy

Exercise Pg 4 Workbook

Research designs



Levels of Evidence

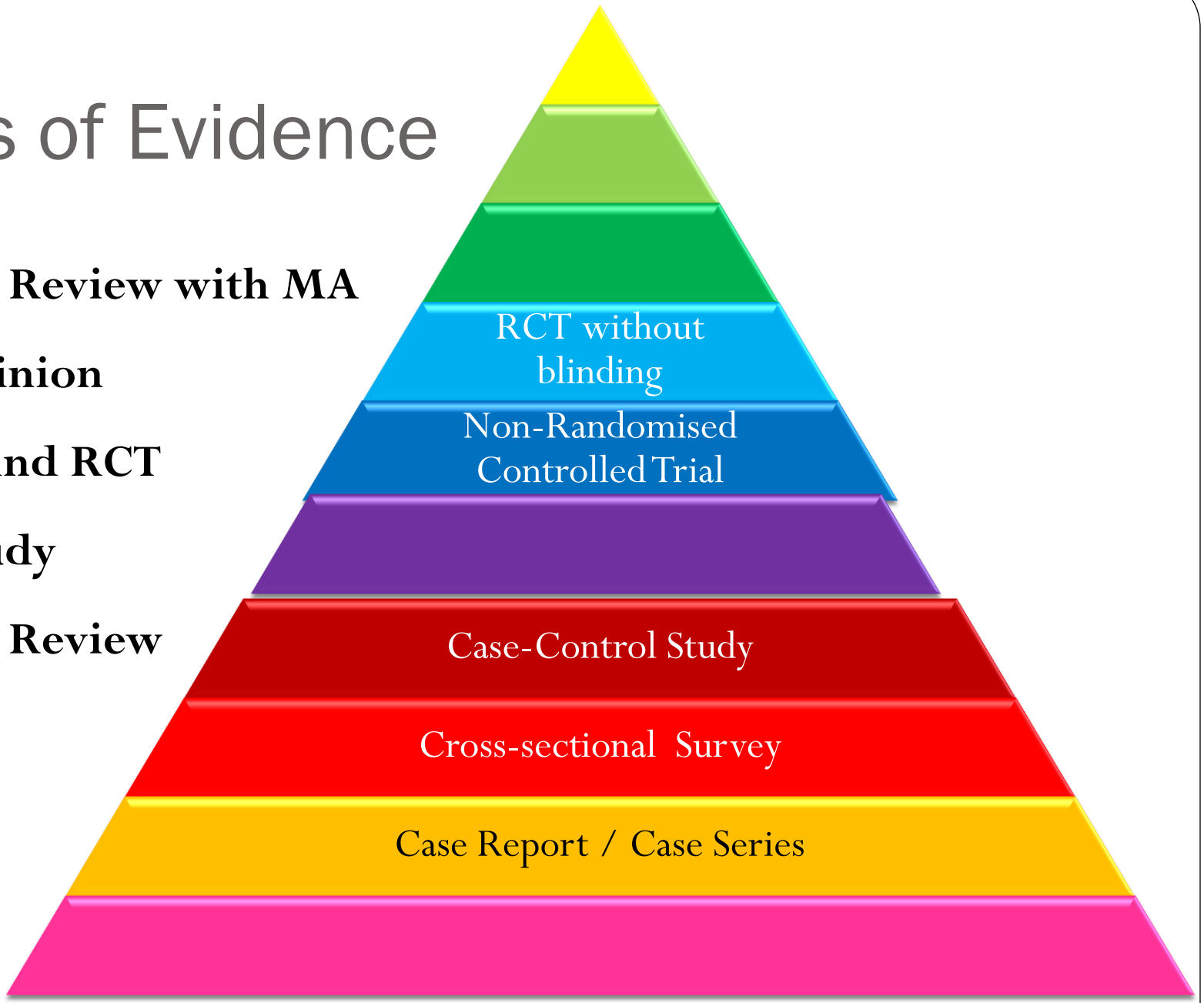
Systematic Review with MA

Expert Opinion

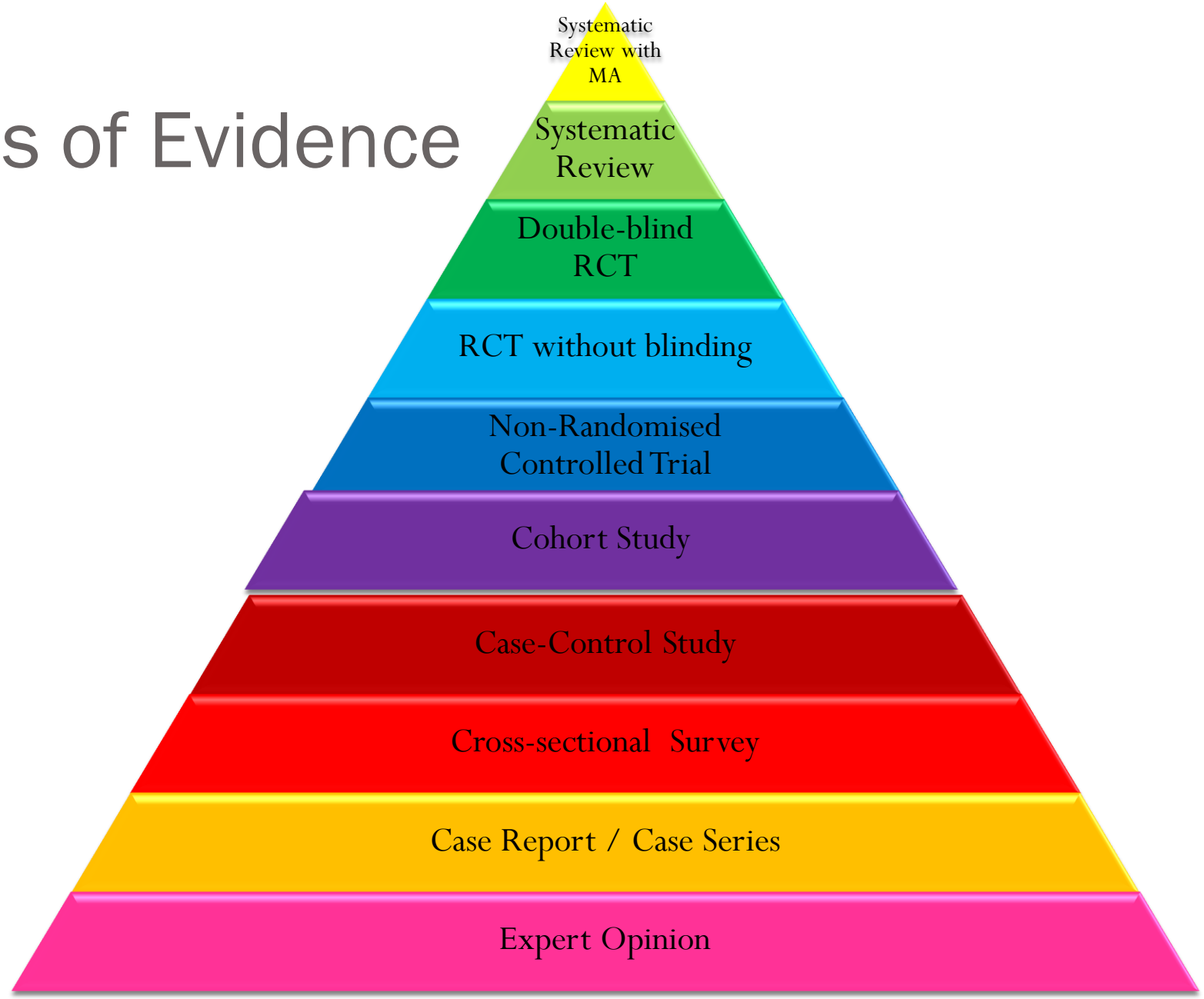
Double-blind RCT

Cohort Study

Systematic Review



Levels of Evidence



QUICK QUIZ

What is bias?

A Favouritism shown by a course leader

B Something used to bind the hem of a skirt

C Factors affecting the results of a study

Types of Bias

Types of Bias

Power Calculation: *The ability of a study to detect the smallest clinically significant difference between groups when such a difference exists.* The probability of detecting a chance finding decreases with an increasing sample size. A lack of a clinically significant effect could be due to insufficient numbers rather than the intervention being ineffective.

Selection bias: A systematic error in choosing subjects for a study that results in an uneven comparison. Selection bias may refer to the how the sample for the study was chosen (*external validity*) or systematic differences between the comparison groups that is associated with outcome (*interval validity*) of a study.

Randomisation: All participants should have an equal chance of being assigned to any of the groups in the trial. The only difference between the 2 groups should be the intervention. Any differences in outcome can then most likely be contributed to the interventions and no other variable (e.g. patient characteristics).

Randomisation

True or false: Randomisation is important when testing an intervention is effective because:

Every patient has an equal chance of entering either arm……

It guarantees that the intervention group and control group are comparable……

Allocation to either arm is concealed……..

Types of Bias

Ascertainment Bias (Blinding): Random concealment up to the point of assignment is used to minimise selection bias. By contrast, blinding after a patient has been assigned serves primarily to reduce **performance bias** (in patients and carers)

Attrition: The loss or exclusion of participants during a trial is known as **attrition**. The result of such attrition is that the investigators are left with incomplete outcome data; their sample is reduced.

Confounding: A confounder is a factor that is: Linked to the outcome of interest, independent of the exposure. Linked to the exposure but not the consequence of the exposure.

Confounding

What is the confounding factor in the following relationships:

People who carry matches are more likely to develop lung cancer

People who eat ice-cream are more likely to drown

Training in anaesthesia is more likely to make doctors commit suicide

Other Considerations

Integrity of Intervention: Are the results of ineffectiveness within primary studies due to incomplete delivery of the intervention or a poorly conceptualised intervention?

Outcome measures: Endpoints. Validity. Reliability.

Reporting Bias: Selective Reporting.

Pin the Bias on the RCT

Allocation bias

Attrition bias

Confounding

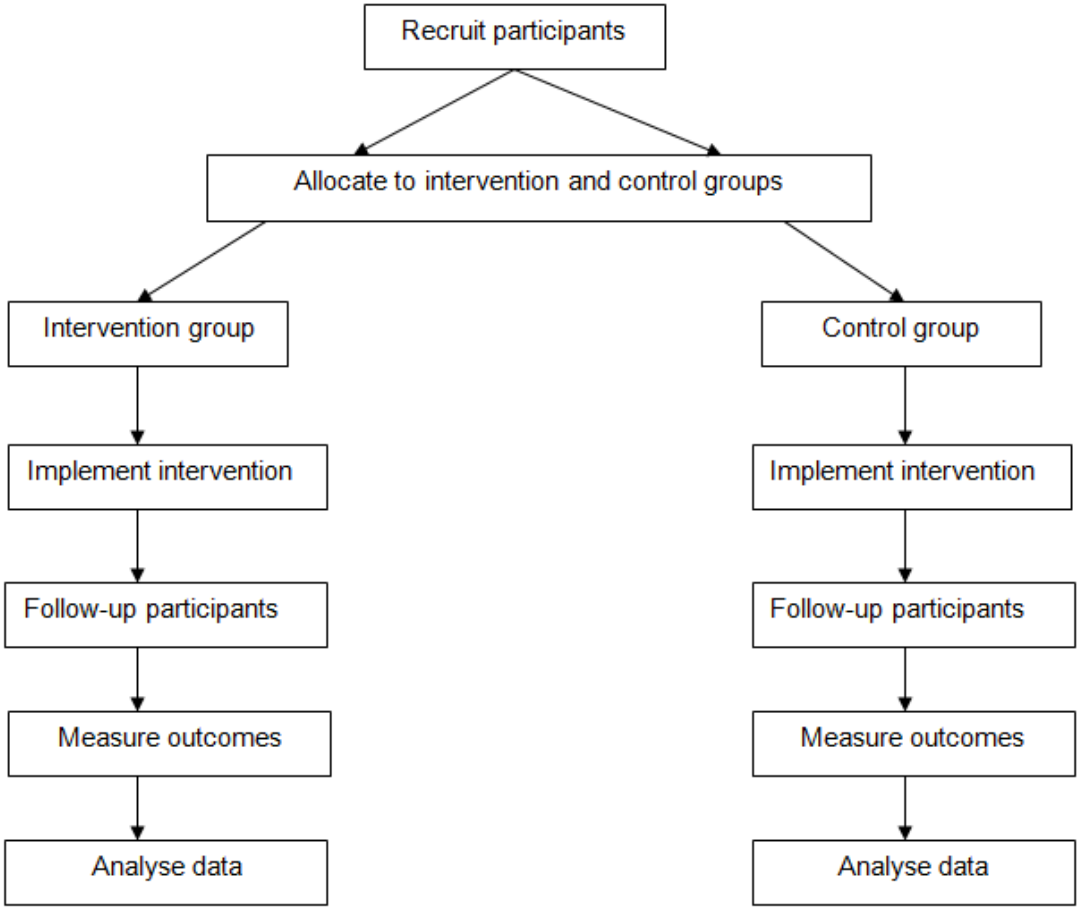
Integrity of intervention

Power calculation

Reliability of outcome tool

Selection bias

Validity of outcome tool



Exercise Pg 6 Workbook

Ben Goldacre Video

https://www.ted.com/talks/ben_goldacre_what_doctors_don_t_know_about_the_drugs_they_prescribe/transcript?language=en

https://www.youtube.com/watch?v=RKmxL8VYy0M

Models of Critical Appraisal

Scales

These generate a "score". Those categorised as "good" studies may be assigned a pre-review threshold score, eg. 3/5. The Jadad scale is perhaps the most well-known.

Checklists

Checklists offer a logical and structured approach to assessing methodological quality. Perhaps the most commonly-used example of this tool is produced by the UK Critical Appraisal Skills Programme (CASP).

Guidance notes are given to define the exact meaning of each possible answer. Space is also provided to write comments, but the answers tend to be simply Yes, No or Unclear. These results are not aggregated, but the questions are all pre-set and are supposed to be answered.

Domains

These focus on very specific elements of study design and conduct that might adversely affect the internal validity of a study. These criteria can differ depending on the review question and topic. It does not seek to assign a "score" to a study, nor is it restricted to answering all items. Rather, the tools assign a risk of bias for each domain, such as randomisation, and consider what the study has reportedly done to minimise that bias.

The best-known and universally-used examples of this type of appraisal tool are the Cochrane risk of bias tool.

Scales

Jadad Score Calculation	
Item	Score
Was the study described as randomised?	0/1
Was the method used to generate sequence of randomisation described and appropriate?	0/1
Was the study described as double blind?	0/1
Was the method of double blinding described and appropriate?	0/1
Was there a description of withdrawals and dropouts?	0/1

Jadad AR, Moore RA, Carroll D, *et al*. Assessing the quality of reports of randomized clinical trials: is blinding necessary? *Control Clin Trials* 1996;**17**:1–12.

Domain based

Bias domain	Source of bias	Support for judgment	Review authors' judgment (assess as low, unclear or high risk of bias)
Selection bias	Random sequence generation	Describe the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups	Selection bias (biased allocation to interventions) due to inadequate generation of a randomised sequence
	Allocation concealment	Describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen before or during enrolment	Selection bias (biased allocation to interventions) due to inadequate concealment of allocations before assignment
Performance bias	Blinding of participants and personnel*	Describe all measures used, if any, to blind trial participants and researchers from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective	Performance bias due to knowledge of the allocated interventions by participants and personnel during the study
Detection bias	Blinding of outcome assessment*	Describe all measures used, if any, to blind outcome assessment from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective	Detection bias due to knowledge of the allocated interventions by outcome assessment
Attrition bias	Incomplete outcome data*	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomised participants), reasons for attrition or exclusions where reported, and any reinclusions in analyses for the review	Attrition bias due to amount, nature, or handling of incomplete outcome data
Reporting bias	Selective reporting	State how selective outcome reporting was examined and what was found	Reporting bias due to selective outcome reporting
Other bias	Anything else, ideally prespecified	State any important concerns about bias not covered in the other domains in the tool	Bias due to problems not covered elsewhere

*Assessments should be made for each main outcome or class of outcomes.

BMJ 2011;343:d5928 doi: 10.1136/bmj.d5928

Checklists

A. Are the results of the study valid?

Screening Questions

1. Did the study ask a clearly-focu

☐ Yes ☐ Can't Tell ☐ No

HINT: Consider if the question is 'focused' in terms of:
- the population studied
- the intervention given
- the outcomes considered

2. Was this a randomised controlled trial (RCT) and was it appropriately so?

☐ Yes ☐ Can't Tell ☐ No

HINT: Consider:
- why this study was carried out as an RCT
- if this was the right research approach for the question being asked

Is it worth continuing?

Detailed Questions

3. Were participants appropriately allocated to intervention and control groups?

☐ Yes ☐ Can't Tell ☐ No

HINT: Consider:
- how participants were allocated to intervention and control groups. Was the process truly random?
- whether the method of allocation was described. Was a method used to balance the randomization, e.g. stratification?
- how the randomization schedule was generated and how a participant was allocated to a study group
- if the groups were well balanced. Are any differences between the groups at entry to the trial reported?
- ere differences reported that might have any outcome(s) (confounding)

ts, staff and study personnel 'blind' study group?

☐ Yes ☐ Can't Tell ☐ No

HINT: Consider:
- the fact that blinding is not always possible
- if every effort was made to achieve blinding
- if you think it matters in this study
- the fact that we are looking for 'observer bias'

5. Were all of the participants who entered the trial accounted for at its conclusion?

☐ Yes ☐ Can't Tell ☐ No

HINT: Consider:
- if any intervention-group participants got a control-group option or vice versa
- if all participants were followed up in each study group (was there loss-to-follow-up?)
- if all the participants' outcomes were analysed by the groups to which they were originally allocated (intention-to-treat analysis)
- what additional information would you liked to have seen to make you feel better about this

6. Were the participants in all groups followed up and data collected in the same way?

☐ Yes ☐ Can't Tell ☐ No

HINT: Consider:
if, for example, they were reviewed at the same time intervals and if they received the same amount of attention from researchers and health workers. Any differences may introduce performance bias.

CASP RCT Checklist

Critical Appraisal Skills Programme (CASP)

Making sense of evidence

HOME | CRITICAL APPRAISAL | WORKSHOPS | CASP TOOLS & CHECKLISTS | ABOUT CASP | More

CASP CHECKLISTS

This set of eight critical appraisal tools are designed to be used when reading research, these include tools for Systematic Reviews, Randomised Controlled Trials, Cohort Studies, Case Control Studies, Economic Evaluations, Diagnostic Studies, Qualitative studies and Clinical Prediction Rule.

These are free to download and can be used by anyone under the Creative Commons License.

CASP Checklists (click to download)

CASP Systematic Review Checklist	CASP Qualitative Checklist
CASP Randomised Controlled Trial Checklist	CASP Case Control Checklist
CASP Diagnostic Checklist	CASP Cohort Study Checklist
CASP Economic Evaluation Checklist	CASP Clinical Prediction Rule Checklist

Critically Appraising an Article

Use the CASP Checklist provided to critically appraise the article

- What type of Study is it?
- What Bias have you recognised?

Other Library Services

- UptoDate
- DynaMed
- Anatomy.TV
- Literature searching Service
- Article and book requests
- Current Awareness
- Training in accessing online resources and critical appraisal
- Library facilities – PCs with Internet access, printing, scanning and photocopying

Library outreach service

The library

Level 5, Education Centre

Upper Maudlin St

Tel. ext. 20105

Email. library@uhbristol.nhs.uk