Introduction to Dental Research and evidence-based Practice

Ikhlas El Karim

Mike Clarke

Objectives



Understand the importance of research in dentistry and patient care.



Describe common research study designs and their applications



Apply basic principles of evidence-based practice when evaluating research.



Recognise how research evidence is translated into clinical practice and guidelines

Activity 1: Clinical Decision Challenge

Do antibiotics improve outcomes for periodontal disease?

Is fluoride varnish more effective for preventing caries in children than SDF?


Dental School
Guidelines
Clinical decision
Colleagues
Research

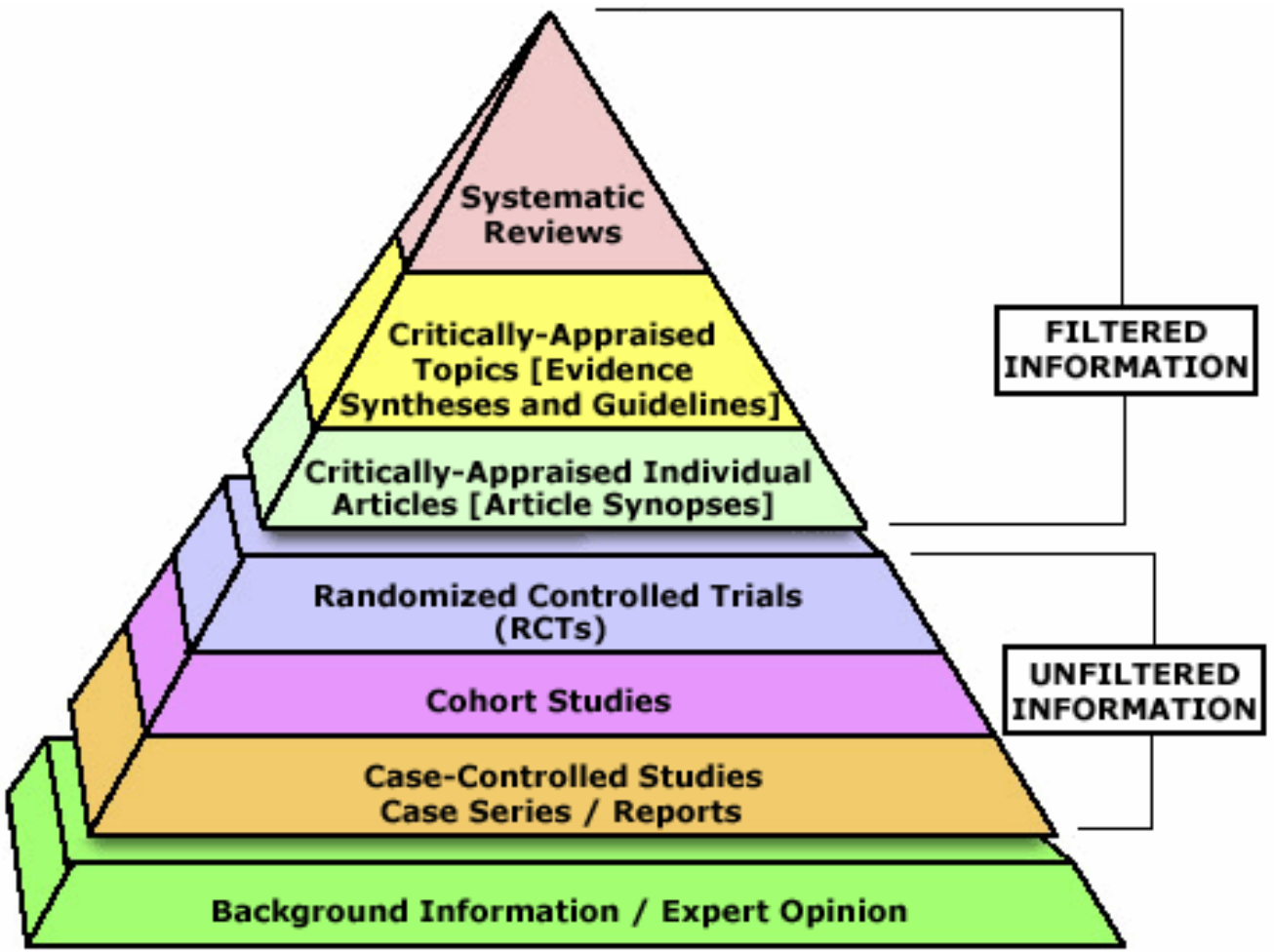
How do we know which evidence to trust?



TYPE

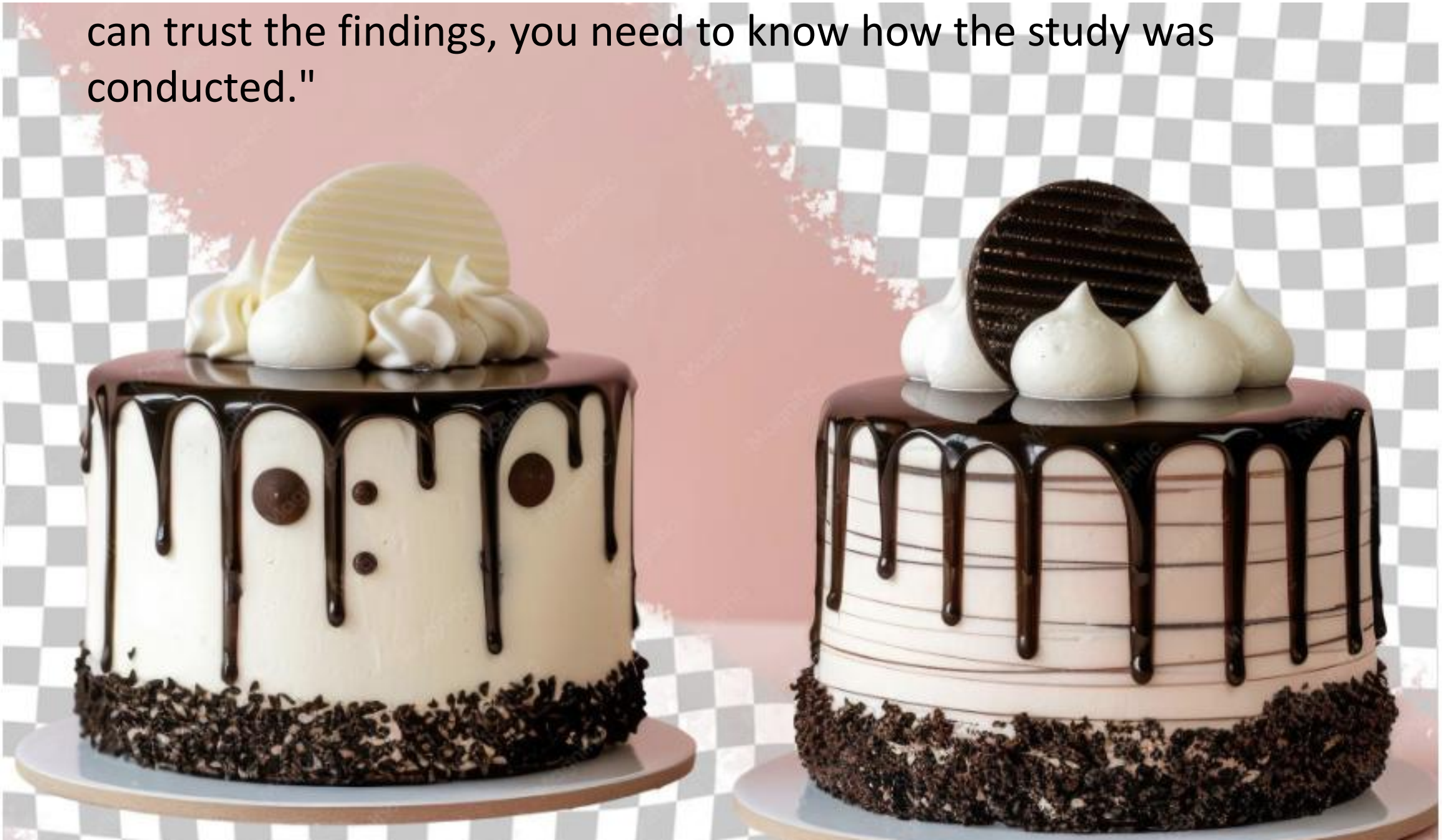


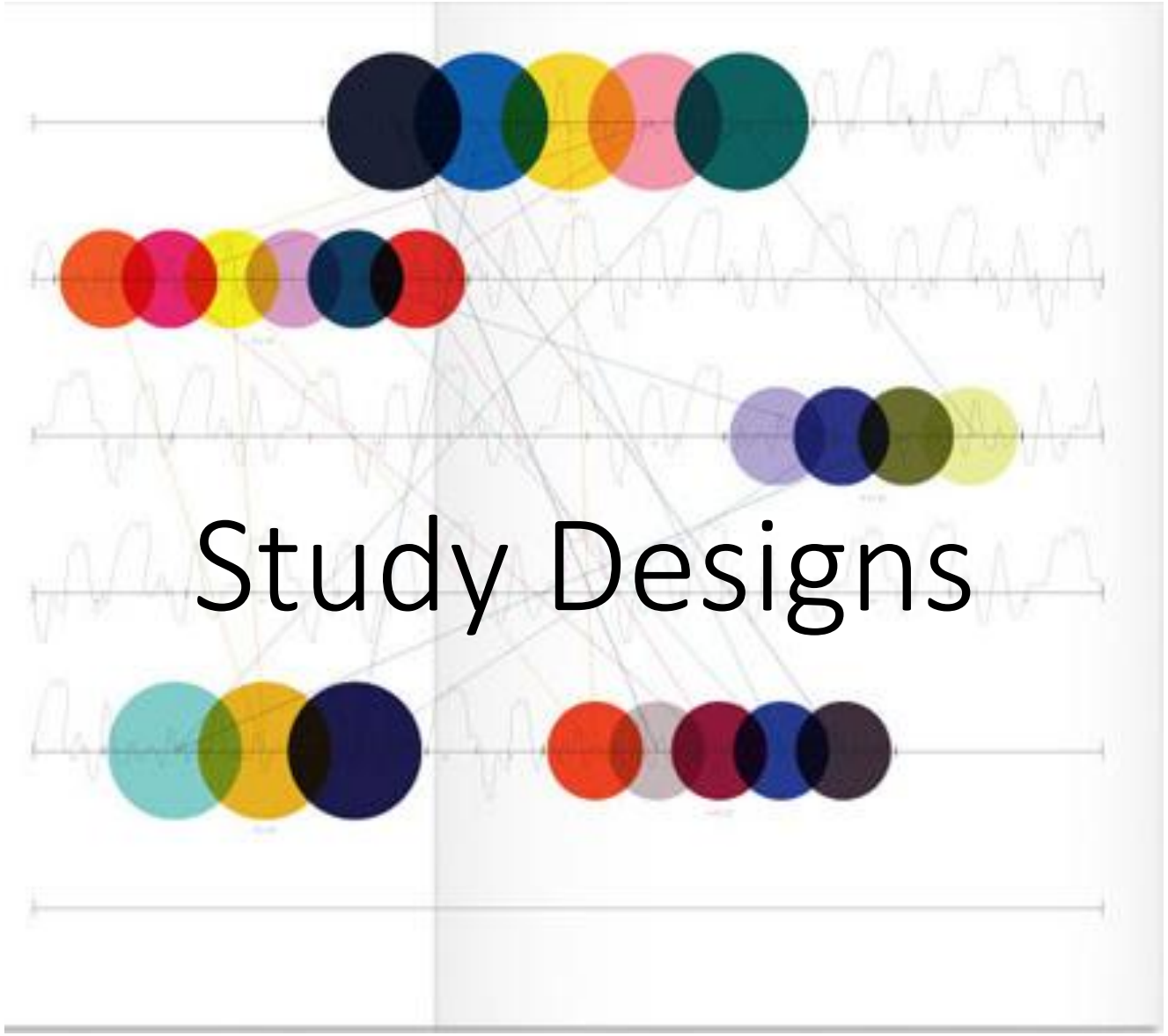
QUALITY



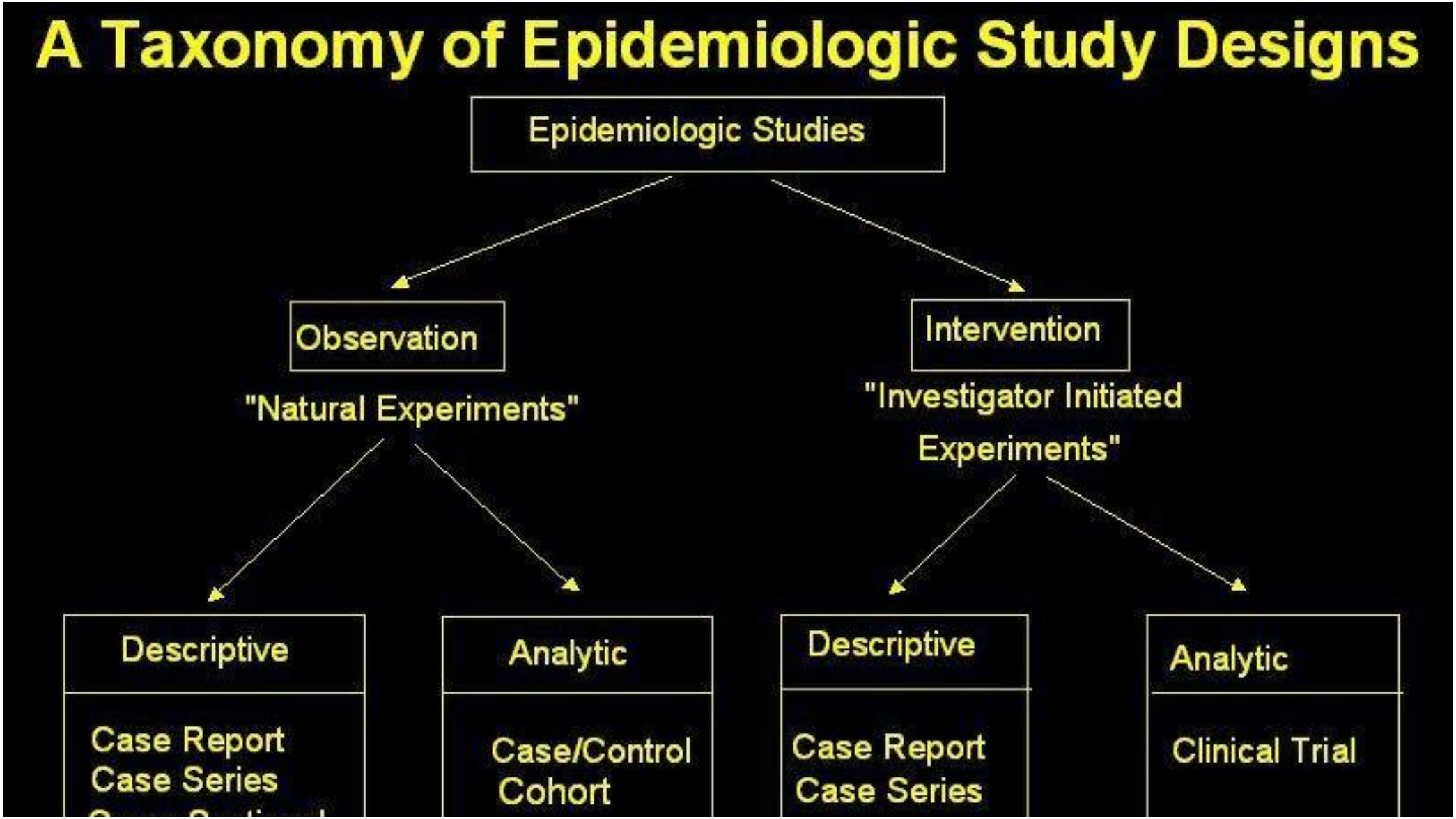
Hierarchy of Evidence

Research evidence is the same. Before deciding whether you can trust the findings, you need to know how the study was conducted."





Study Designs


A Taxonomy of Epidemiologic Study Designs
Epidemiologic Studies
Observation
"Natural Experiments"
Intervention
"Investigator Initiated Experiments"
Descriptive
Case Report
Case Series
Analytic
Case/Control
Cohort
Descriptive
Case Report
Case Series
Analytic
Clinical Trial

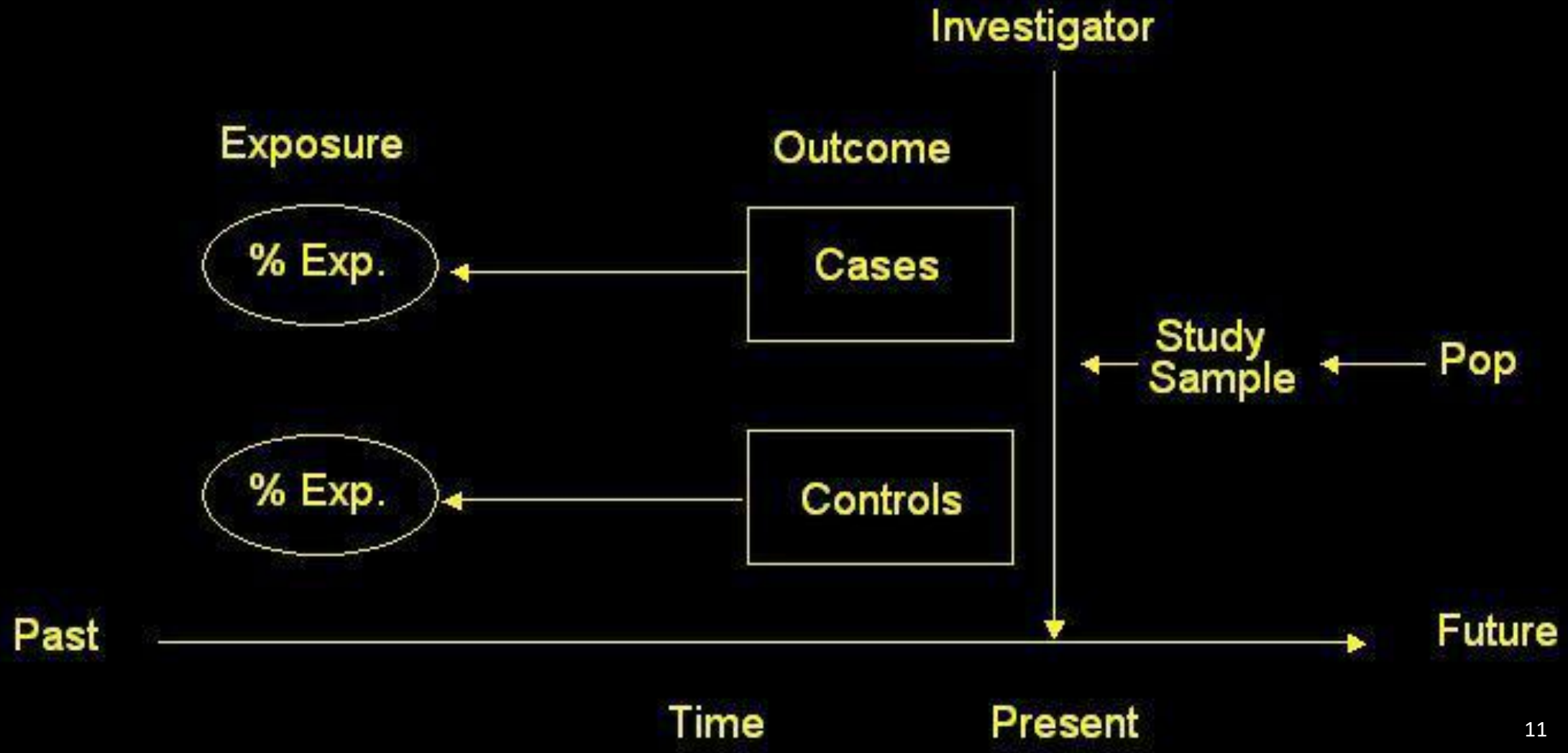
Cross-sectional Studies

Measure exposure and effect at the same time (assess if exposure precedes or follows the effect)

Easy and economical to conduct.

Data from cross-sectional studies are helpful in assessing the health care needs of populations.

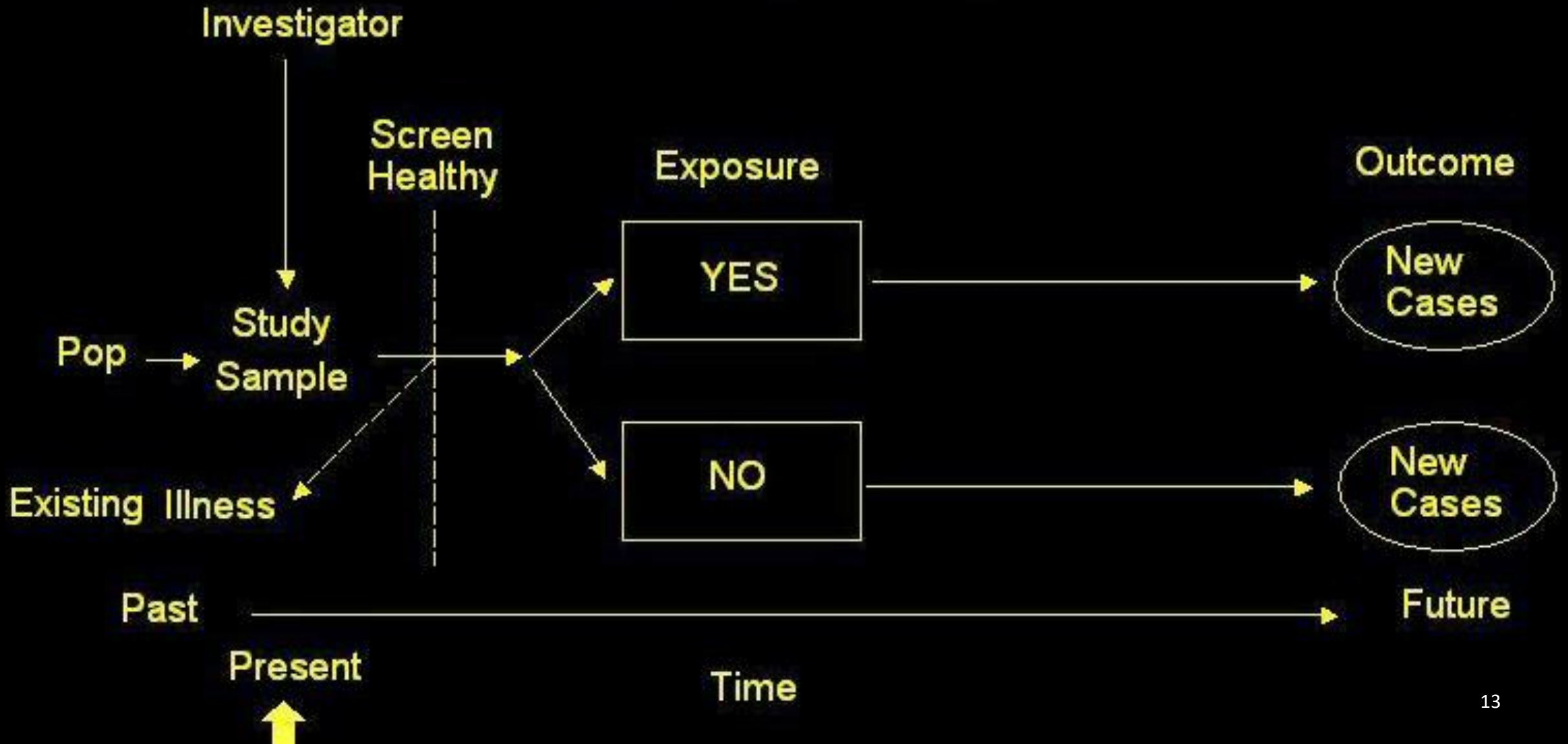
Case Control Studies (retrospective)



Case-control studies

- Simple and economical to carry out.
- Increasingly used to investigate causes of diseases.
- Data concerning more than one point in time is collected.
- Recall bias is a limitation

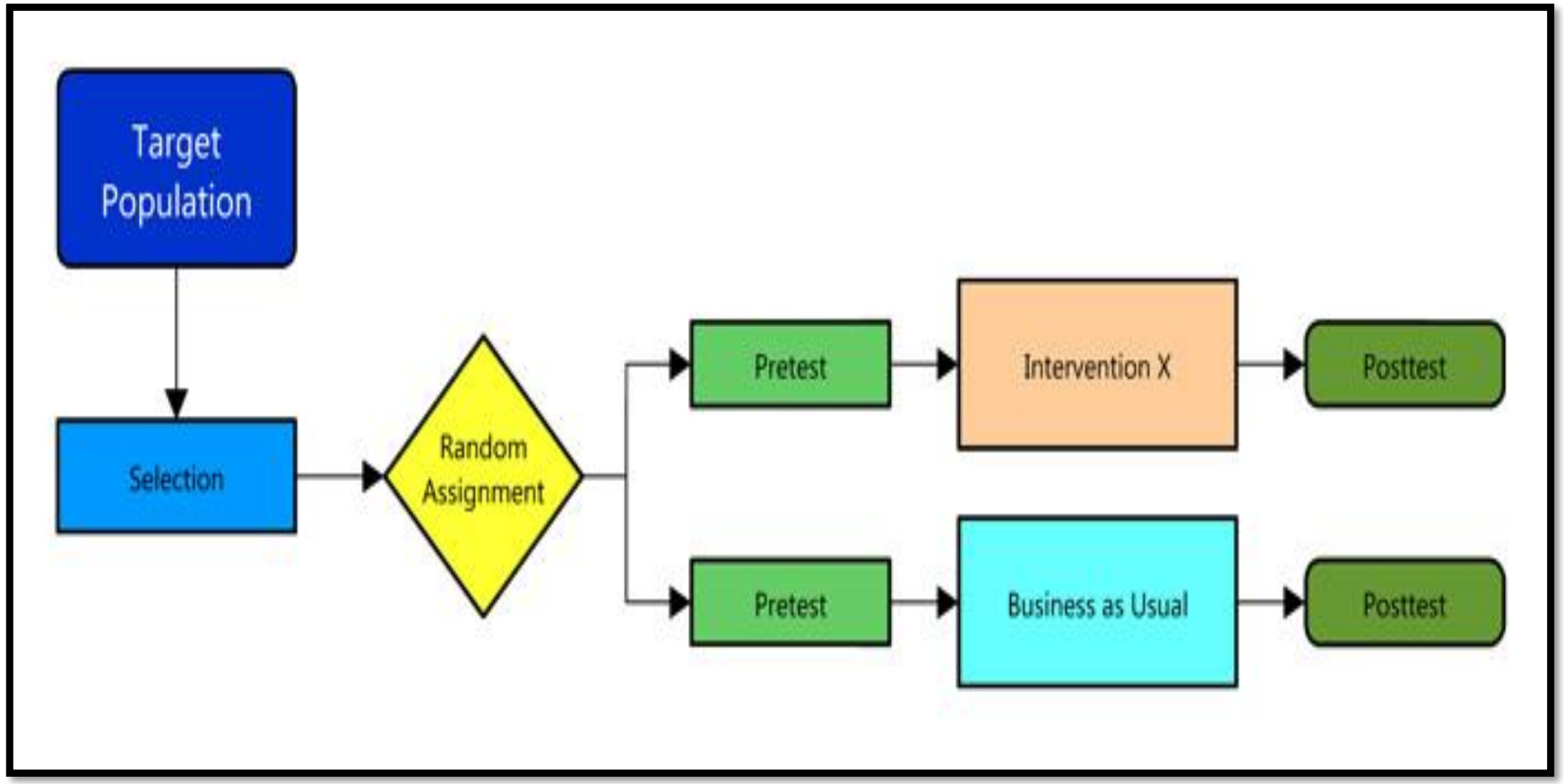
Cohort Studies (prospective)



Cohort studies

- Begin with monitoring a group of individuals over a period of time.
- Classified into subgroups according to levels of interest or exposure to a risk factor.
- The cohort is then monitored for a period of time and a change in status is noted.
- Costly, need long follow up

Randomised Controlled Trials (RCT)



Randomised Controlled Trials

Gold standard for evidence

Double blind RCT

Single blind RCT

Non blind RCT

Treatment comparisons made between subjects – Parallel group design

Treatment comparisons within subjects – Matched design or Cross-over studies

Group activity: Research Detective Game



- **Card A1**

Is fluoride varnish as effective as fluoride fissure sealants for caries prevention in children

- **Card A2**

Is Ibuprofen as effective as paracetamol in reducing postoperative pain after 3rd molar removal

- **Card B1**

Is consumption of fizzy drinks increase the risk of erosion?

- **Card B2**

Does brushing twice daily improve oral health?

- **Card C1**

Would smoking predispose to oral cancer?

- **Card C2**

What is the prevalence of periimplantitis in patients attending the periodontal department at the school of dentistry

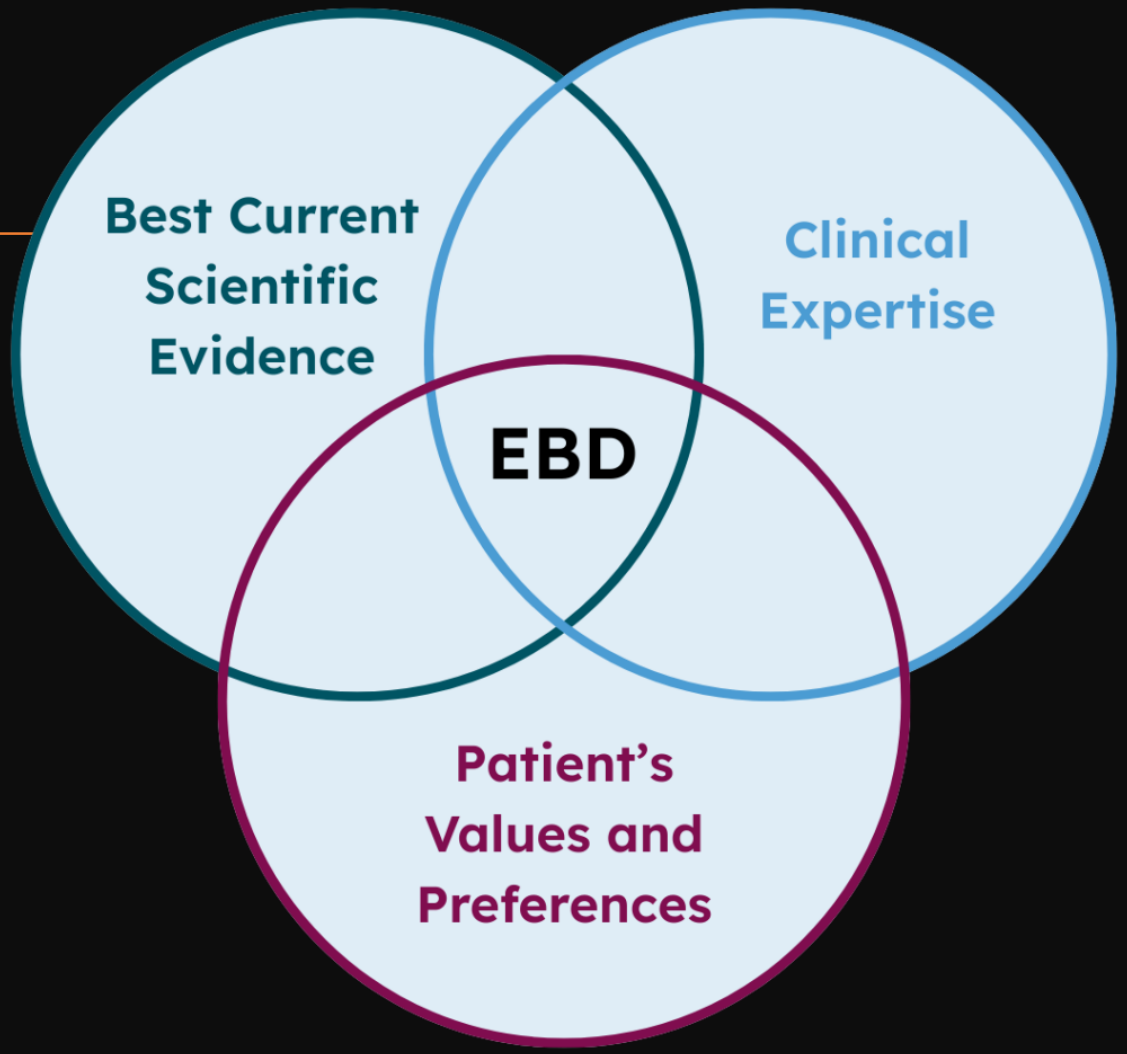
Design choice depends on:

- The type of question being asked (therapy, risk factor, prevalence, diagnosis).
- Practical considerations (time, cost, feasibility).
- Ethical considerations (whether participants can be allocated to an exposure).
- The level of evidence required.

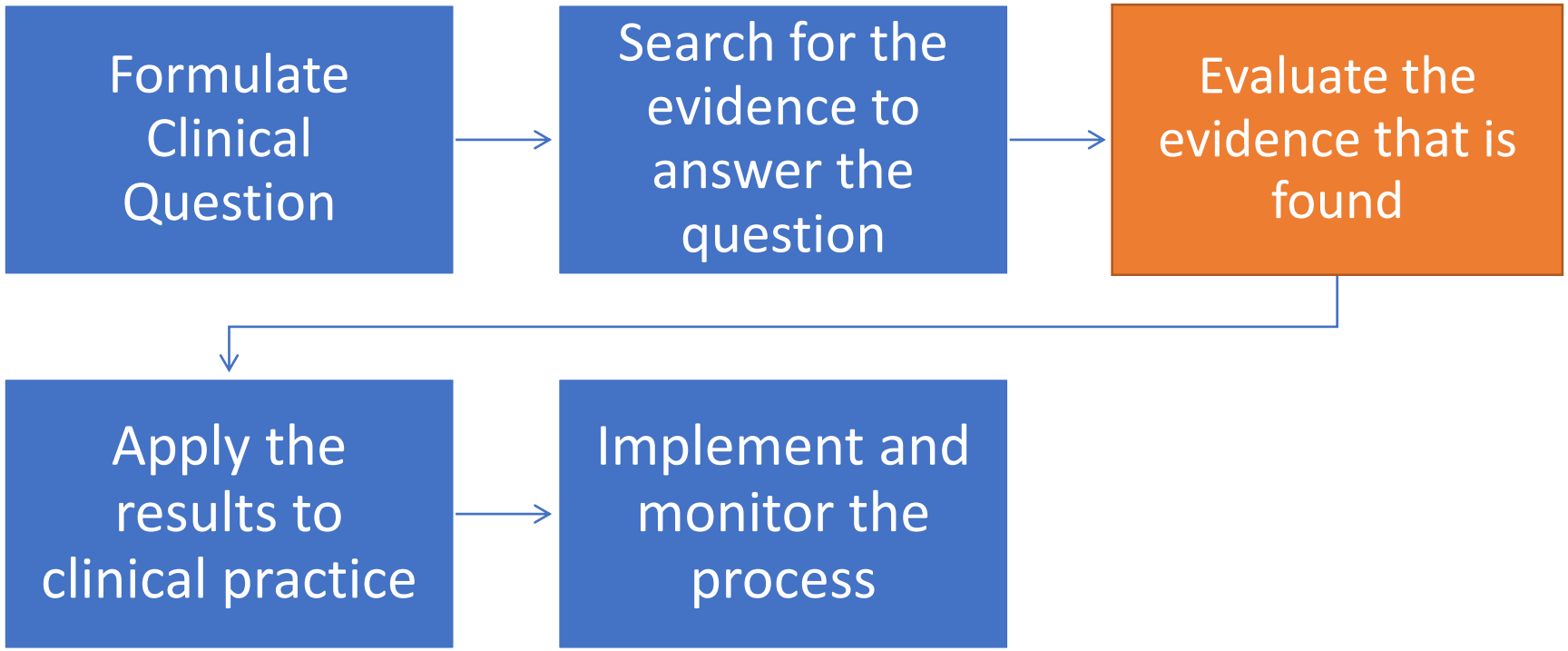


Break

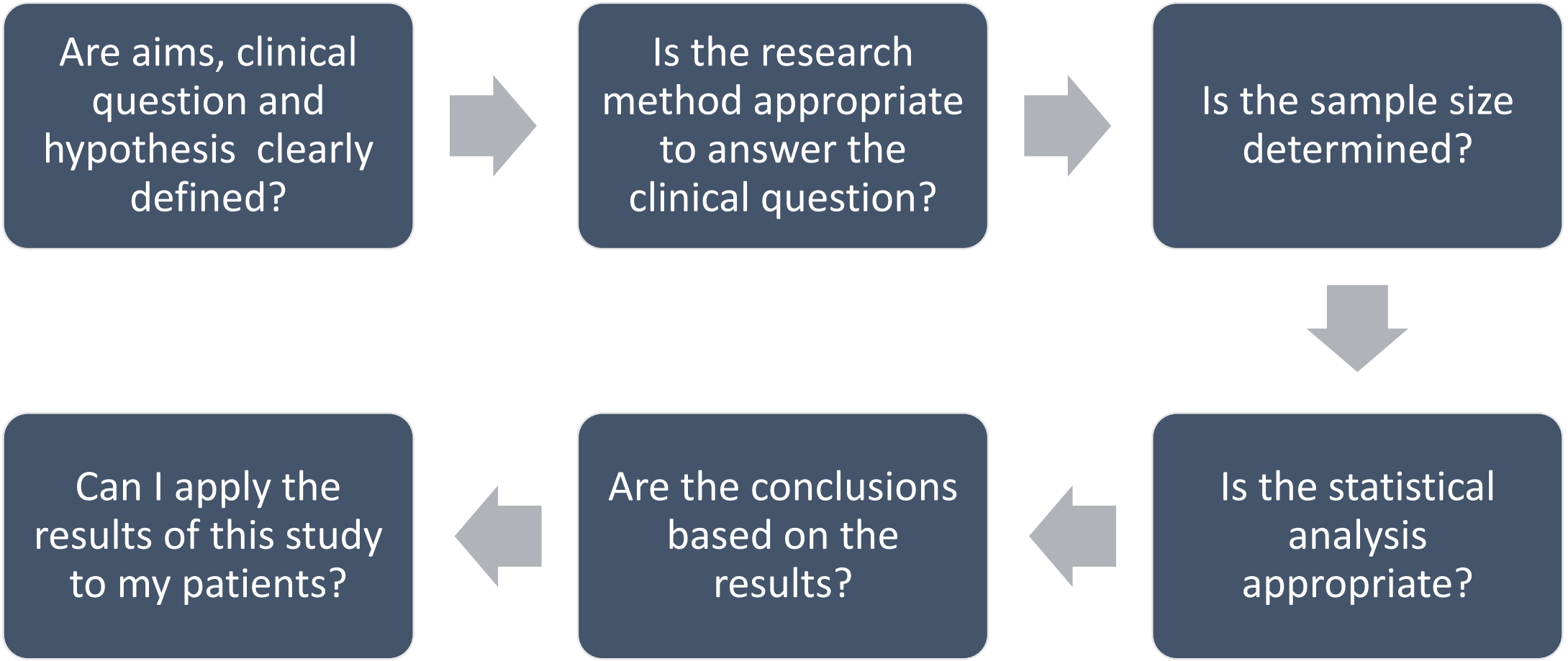
Evidence based Practice



Process of Evidence based Dentistry



Critical Appraisal



Are The Aims Clearly Stated?

Think of the PICOs

Is The Study Design Appropriate?

Can the design adequately answer the research question or address the objectives

Is there evidence of Bias?

Think of different types of bias, are they identified and assess their impact
How risk of bias is assessed?

Are confounding factors controlled for?

Is The Sample Size Determined?

Is The Statistical Analysis Appropriate?

Is there evidence of Bias?

Systematic error or deviation from the truth in results or inferences

Type of bias	Description	Avoidance
Selection bias	Differences between baseline characteristics of the groups being compared	Randomisation
Performance bias	Difference between groups in the care provided	Blinding
Detection bias	Differences between groups in how outcomes are determined	Blinding
Attrition bias	Differences between groups in withdrawals from the study	Statistic methods (Intention-to treat analysis)

Is The Sample Size Determined?

A research study with good power is normally able to detect a change when it actually exists

As a general rule, the larger the sample size the more power the study has.

Power should be at least 80%

Power can be used to calculate the minimum sample size required

Is The Statistical Analysis Appropriate?

- Right test for the right data
- Interpretation of the results

Type of Data and Statistical Tests

	Categorical Data	Continuous-non normally distributed Data	Continuous-Normally distributed Data
Descriptive	Mode frequency	Median Range	Mean Standard deviation
Comparing two groups	Chi-square Test and Fisher's Exact Test	Mann-Whiteny U Test	Student T Test
Comparing > two groups	Mc Nemars Test	Kruskal Wallis Test	ANOVA Test

Interpretation of p-value

- The probability that an observed difference could have occurred by chance.
- By arbitrary convention $p < 0.05$ is the accepted threshold for statistical significance
- $p \leq 0.05$ there **is** enough evidence to reject the null hypothesis
- $P > 0.05$ there **is not** enough evidence to reject null hypothesis

Interpretation of confidence Interval

Fluoride varnish vs fissure sealant

20% fewer carious lesions with fissure sealants
95% CI: 5% to 35% fewer lesions

What Does This Mean?

- **20%** is our best estimate of the benefit.
- The true benefit could be as small as **5%** or as large as **35%**.
- The confidence interval shows the range of values where the true value likely to lie.

Research Appraisal Exercise

- Critically evaluate and grade the evidence presented in the paper
- Would you change your practice or apply this evidence to your patients? explain why



Research, Audit, QI or Service Evaluation?

- These activities all help improve patient care, but they have different aims, methods, and governance requirements.

Activity	Main Question	Purpose	Example in Dentistry
Research	What is the best thing to do?	Generate new knowledge.	Does silver diamine fluoride reduce caries progression better than fluoride varnish?
Clinical Audit	Are we doing what we should be doing?	Measure practice against a predefined standard.	Are we prescribing antibiotics according to local antimicrobial guidelines?
Service Evaluation	How well is our service working?	Assess current service performance.	How satisfied are patients attending the emergency dental clinic?
Quality Improvement (QI)	How can we make our service better?	Test and implement changes to improve care.	Introducing a new referral pathway to reduce waiting times.

Why should we care about research?



Every guideline you follow comes from research



Every treatment recommendation depends on evidence



Evidence protects patients and clinicians

Get involved in Research?

- Idea/question
- Feasibility
- Collaboration
- Funding
- Time

Objectives achieved???



Understand the importance of research in dentistry and patient care.



Describe common research study designs and their applications



Apply basic principles of evidence-based practice when evaluating research.



Recognise how research evidence is translated into clinical practice and guidelines