A Quick Guide to Study Design in the Medical Literature

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Types of Studies

Controlled Studies

- Randomized Clinical Trials (RCT)
- Investigator assigns participants to groups
- Investigator assigns intervention

Observational/Real-World studies

- Cohort studies, case-control studies, case reports
- Participants have already been assigned to groups
- Participants themselves or clinicians determine treatment assignment or exposure, or assignment occurs by chance

RCT Features

- Establish efficacy
- Random treatment assignment based on inclusion/exclusion criteria
- Double blinding
- Identical treatment aside from experimental therapy
- Analysis of results estimates difference in pre-specified outcomes between groups
- Common measures of effectiveness: relative risk reduction (RRR); absolute risk reduction (ARR); and number needed to treat (NNT)

Observational Study Features

- Establish effectiveness, evaluate safety outcomes, inform usage patterns, estimate cost implications
- Examples: cohort studies, case-control studies, case series, cross-sectional studies
- Non-random assignment
- No blinding
- Treatment aside from therapy of interest may vary between groups
- Common outcome measures include: relative risk (RR); odds ratio (OR); and hazard ratio (HR)

Study Design Comparison

Controlled Studies

- Random assignment
- Prospective design
- Tightly controlled research protocol
- Highly select patient population
- Well-resourced

Observational/Real-World studies

- Non-random assignment
- Prospective or retrospective design
- Real-world treatment practices
- Diverse patient population
- Local resource/cost constraints

Study Design Strengths and Weaknesses

Controlled Studies

- Gold standard method for establishing efficacy
- External validity (generalizability) may be limited
- Limited ability to detect important safety outcomes
- Expensive and resource intensive

Observational/Real-World studies

- Establish effectiveness and detect safety signals
- Reflect standard clinical care
- Internal validity limited by selection bias and confounding
- Incomplete/missing data

Summary

- A key limitation of RCTs is generalizability
- Key limitations of observational studies are selection bias and confounding
- Most often EFFECTIVESS < EFFICACY
- A statistically significant result does not always translate into a clinically meaningful benefit

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