2nd Jaipur Surgical Festival (JSF)
HPB Oncology
2-4 December 2022
Mahatma Gandhi Medical College & Hospital (MGMCH)
Jaipur Rajasthan India

SYSTEMATIC REVIEW AND META-ANALYSIS

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This talk covered the following topics:

- Why there is a need for a systematic review and meta-analysis
- What is a systematic review
- How we did a systematic review
- What is a meta-analysis
- Brief outline of the steps of meta-analysis
- How to interpret and analyze a forest plot
- Briefly about publication basis

Systematic Review of Meta-analysis provides the highest level of evidence.

- Answers questions more effectively than individual studies
- Identifies problem in primary research – corrected in future studies
- Future research priorities
- Benefits authors and journals
- Generates higher level evidence

Types of review articles -

- Narrative
- Qualitative (Systemic Review)
- Quantitative (Meta-analysis)

Systematic review:

Systematic review is a comprehensive search for relevant studies on a specific topic and those identified are then appraised and synthesized according to a predetermined and explicit method.

1. Elements of a Systematic review:
2. Formulate the review question & write
3. Search for and include primary studies:
    a. Search tools used can be Medline, Embase, Google Scholar, Cochrane
    b. At least two independent authors should do the independent search.
    c. Identify keywords (MeSH) and use the Boolean operators to narrow or broaden your search.
    d. Register Systemic review-meta-analysis in PROSPERO. It's a registry for systematic review and meta-analysis protocols.
4. Assess study quality.
   Extract and analyze the data.
5. Interpret results & write a report

Reporting of Systemic Review:

The preferred reporting items for systematic reviews and meta-analysis (PRISMA) is a 27 item checklist used to improve transparency in systematic reviews.

Meta-analysis:

A meta-analysis is the statistical combination of at least 2 studies single estimate of the effect of the healthcare intervention under consideration.

1. The steps to perform a MA are
    a. Tabulate Summary data
    b. Graph data
    c. Check for heterogeneity
    d. Perform a meta-analysis if heterogeneity is not a major concern
    e. If heterogeneity is found, identify factors that can explain it
    f. Evaluate the impact of study quality on results
    g. Explore the potential for publication bias.

The graph of the data in a MA is depicted as a forest plot.

How to read a Forest Plot:

- You should watch the video for proper understanding.
- Forest plot is a efficient way of presenting the summary results.
- Forest plot presents the point estimate and CI of each trial.
- Forest plot present the overall summary estimate.
- Forest plot allows visual appraisal of heterogeneity

Other graphs are

- Cumulative meta-analysis
- Sensitivity analysis
- Funnel plot for publication bias
- galbraith l"abbe plots etc.

Heterogeneity:

Heterogeneity indicates the effect varies a lot across studies. If heterogeneity is present, a common, summary measure is hard to interpret.

Heterogeneity is due to differences in-

- Patient populations studies
- Interventions used
- Co-interventions outcomes measured
- Study design features
- Study quality
- Random error

How to look for heterogeneity?

1. **Visual-**

- Forest plot:
    - Do confidence intervals of studies overlap with each and the summary effect
- Labbe plot

2. **Statistical tests:-**

- **Chi-square test for heterogeneity (Cochran Q test)**
    - Tests whether the individual effect are farther away from the common effect beyond what is expected by chance
    - ***Has poor power***
    - ***P-value<0.10 indicates significant heterogeneity***
- **I-squared% of total variability in effect measure that is attributable to heterogeneity**
    - Values 25%, 50% and 75% representing low and high heterogeneity respectively

Publication bias

Studies with significant result are more likely

- To be published
- To be published in English
- To be cited by others
- To produce multiple publications

Including only published studies can introduce publication bias

Methods for detecting publication bias:

- Graphical funnel plot asymmetry
- Tests egger test rosenthals fail-safe N (all have low power)

Summary

- Systematic review & meta- provides high level of evidence.
- Answers the question analysis that otherwise could not be answered by individual studies
- Systematic review does not need statistics back-up
- Systemic review & meta-analysis use PRISMA checklist
- IMRAD pattern
- It's important to interpret and analyse Forest plot in meta-analysis.

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