Meta-Analysis: A Versatile Tool for Conducting Comparative Effectiveness Research
Meta-Analysis

- What is a meta analysis?
- Relevance to CER
- Why do one?
- Examples
- Limitations
What Is Meta-Analysis?

- Methodologies focused on combining results across multiple studies.
- Analysis typically relies on published data, not the original data used within published studies.
- May be used in the context of observational and interventional studies.
Generic Meta-Analysis Methodology

- Search the relevant literature, assess quality
- Refine search using inclusion/exclusion criteria
- Abstract data (e.g. study outcomes & variability estimates, sample sizes)
Generic Meta-Analysis Methodology

- Pool outcomes of interest, typically weighted by inverse of sampling variance
- Investigate possible heterogeneity & publication bias
- Report findings
Useful for a variety of purposes:

- Summarizing head-to-head comparisons of 2 interventions
- Making comparisons of 2 interventions that haven’t previously been compared head-to-head
- Settling controversies from apparently conflicting studies
- Answering questions not posed by the individual studies
Relevance to CER

- Useful for a variety of purposes:
  - Moderator analysis: patient subpopulations
  - Moderator analysis: intervention characteristics
  - Rare events (e.g. adverse events) may be more easily addressed
  - Quantifying heterogeneity of treatment effects
The process of reviewing the literature can help one gain greater knowledge in an area of research.

Can help identify gaps in research (i.e. targets for future projects/funding).

Hypothesis generating.

“Cheap” way for a junior investigator to get a publication.
1-Day Absolute Change in Serum Creatinine vs. 1-Day Change in MAP

Weighted rho = -0.76
p < 0.0001

Moderator Analysis: Modality Effects

<table>
<thead>
<tr>
<th>Technology</th>
<th>Studies, No.</th>
<th>Weighted Proportion, %</th>
<th>95% CI</th>
<th>Q Statistic</th>
<th>Q P Value</th>
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<tr>
<td>VB</td>
<td>10</td>
<td>72.0</td>
<td>(65.7-78.4)</td>
<td>21.0</td>
<td>.01</td>
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<tr>
<td>ENB</td>
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<td>67.0</td>
<td>(62.6-71.4)</td>
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<tr>
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<td>(64.4-81.9)</td>
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<td>U</td>
<td>11</td>
<td>70.0</td>
<td>(65.0-75.1)</td>
<td>15.2</td>
<td>.12</td>
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<tr>
<td>R-EBUS</td>
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<td>71.1</td>
<td>(66.5-75.7)</td>
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<td>70.0</td>
<td>(67.1-72.9)</td>
<td>119.4</td>
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</tr>
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</table>

VB = virtual bronchoscopy; ENB: electromagnetic navigation bronchoscopy; GS = guide sheath; U = ultrathin bronchoscope; R-EBUS = radial endobronchial ultrasound
Limitations

- Meta-analysis is sensitive to publication bias.
- Results may be sensitive to publication quality, which may be difficult to quantify.
- Only as good as the studies that are included
- Inadequate literature searching may yield biased results.

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