Getting to the Bottom-line Using Systematic Reviews for Clinical Decision Making
Innovations in Practice

Thank you for listening and learning!

- Paper 1: Systematic Reviews of Comparative Effectiveness
  — Mary Morrow PhD RN
- Paper 2: Making Sense of Meta-Analysis
  — Jane Walker PhD RN
- Paper 3: Translating Meta-analysis Findings for Clinical Decision Making
  — Lisa Hopp PhD RN FAAN

Symposium Learning Objectives
- Differentiate types of quantitative systematic reviews of effect and harm
- Given results of a meta-analysis, interpret the effect size in terms of the statistical and clinical significance and confidence interval for the effect.
- Using results of a comparative effectiveness systematic review, develop a bottom-line statement that reflects a clinically meaningful translation of the evidence representing the cost and benefit of the treatment.
In other words...

- Types of Quantitative reviews
- Making sense of them
- Translating them


Systematic Reviews of Comparative Effectiveness: Role in Informing CNS Practice

Mary Morrow PhD RN

Big Questions

- What works?
- What harms?
- For whom?
- When?
- How much?
- How often?
- Is it what the patient wants?
Types of Syntheses

Not all syntheses are created equally!

Literature Review

- Reviews of the literature that summarize, critique, and synthesize articles while not using systematic methodology
- **Systematic** reviews adhere to explicit and rigorous methods to identify, critically appraise, and synthesize relevant primary/original studies.
  
  (Krainovich-Miller, 2006:87)

Distinguishing Literature Reviews

1. Focus of the review
2. Goals of the review
3. Perspectives of the reviewer
4. Coverage of the review
5. Organization of the review
6. Audience of the review

(Cooper, 1988 quoted by Cooper & Hedges, 2009:4)
SALSA

• Search
• Appraisal
• Synthesis
• Analysis

Typology of Reviews-14

- Critical review
- Literature review
- State-of-the-art review
- Overview
- Mapping review/systematic map
- Scoping review

Typology of Reviews-14

- Qualitative systematic review/synthesis
- Systematic review
- Meta-analysis
- Mixed studies review/mixed methods review/comprehensive
**Typology of Reviews-14**

- Rapid review (time constrained)
- Systematized review (abridged)
- Umbrella review or Review of reviews

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**Grant & Booth (2009)**

**Systematic Review**

- Seeks to systematically search for, appraise and synthesize research evidence, often adhering to guidelines on the conduct of a review
- Aims for exhaustive, comprehensive searching
- Quality assessment determine inclusion/exclusion
- Typically narrative with tabular accompaniment
- What is known; recommendations for practice. What remains unknown; uncertainty around findings, recommendations for future research

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**According to AHRQ: Terms and Concepts**
The Systematic Review

- Is an ‘attempt to integrate empirical research for the purpose of creating generalizations’ to:
  - ‘produce statements about evidence that are neutral in perspective’
  - ‘uncover all the evidence’
- Explicit and exhaustive reporting of the methods used in syntheses (Cooper & Hedges, 2009:6-7)

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Systematic Review

- ‘a review that has been prepared using a systematic approach to minimizing biases and random errors’ (Rager et al., 2001:5)
- ‘is an attempt to minimize the element of arbitrariness ... by making explicit the review process, so that, in principle, another reviewer with access to the same resources could undertake the review and reach broadly the same conclusions’ (Dixon et al., 1997:157 quoted by Seers, 2005:102).

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Systematic Review

- Quantitative
- Qualitative
- Narrative Synthesis
- Meta-Analysis
- Meta-Aggregation
- Meta-Ethnography
- Comprehensive/Mixed Method
- Meta-Synthesis
- Systematic Review

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PURDUE}\textsuperscript{\textregistered}Northwest
Meta-analysis

- Quantitative evidence
- Use of statistical methods of combining the results of various independent, similar studies
- More precise calculation of one estimate of treatment effect than could be achieved by any of the individual, contributing studies
- Only forms a part of the systematic review in which it appears

Meta-Aggregation

- Qualitative analysis of a number of independent qualitative research studies and text
- Use of qualitative methods of combining the findings of individual studies
- Only forms a part of the systematic review in which it appears

Comprehensive/mixed method Review

- Combines both quantitative and qualitative findings and addresses both forms of evidence
- Requires separate search strategies responding to different types of questions that inform a broad topic
Types of Systematic Reviews

- Traditionally, focused on systematic reviews of randomized controlled trials of therapeutic interventions
- Shift to consider other types of evidence (e.g. qualitative evidence)
- Methodologies/methods constantly evolving
- JBI has developed methodologies/methods for 10 types of systematic reviews

Types of Systematic Reviews

- Effectiveness Reviews
- Qualitative Reviews
- Costs/Economics Reviews
- Prevalence or Incidence Reviews
- Diagnostic Test Accuracy Reviews
- Etiology and Risk Reviews
- Textual Synthesis Reviews
- Mixed Methods Reviews
- Umbrella Reviews
- Scoping Reviews

Key Characteristics of a Systematic Review

- A clearly stated set of objectives with pre-defined eligibility criteria for studies
- An explicit, reproducible methodology
- A systematic search that attempts to identify all studies that would meet the eligibility criteria
- An assessment of the validity of the findings of the included studies
- A systematic presentation, and synthesis, of the characteristics and findings of the included studies (Green et al., 2008:6)
Meta-analysis: 2x2 Tables and Forest Plots

Jane Walker PhD RN

Forest Plots

Non-Invasive Positive Pressure Ventilation vs Usual Care Alone on Intubation

<table>
<thead>
<tr>
<th>Study</th>
<th>NMM</th>
<th>UMM</th>
<th>Total</th>
<th>N</th>
<th>U</th>
<th>Total</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>Heterogeneity</th>
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<td>19</td>
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<td>De Val 1995</td>
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<td>10</td>
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<td>0</td>
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<td>De Val 1996</td>
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<td>0.00 (0.00, 1.0)</td>
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<td>42</td>
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<td>22</td>
<td>11</td>
<td>33</td>
<td>0.25 (0.06, 0.82)</td>
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<td>COMET 2001</td>
<td>12</td>
<td>36</td>
<td>48</td>
<td>20</td>
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<td>32</td>
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<tr>
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<td>12</td>
<td>33</td>
<td>45</td>
<td>20</td>
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<td>19</td>
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<td>28</td>
<td>7</td>
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<tr>
<td>Zhu 2001</td>
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<td>32</td>
<td>39</td>
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<td>22</td>
<td>0.41 (0.18, 0.90)</td>
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</tbody>
</table>

Total (95% CI) | 379 | 1080.75 | 0.42 (0.37, 0.48) | 1.00

Net results: 62 | 116

Heterogeneity: C(2) = 7.3, df = 12 (P = 0.90), I² = 0.0%

Forest plot: 

Meta-analysis: 2x2 Tables and Forest Plots

Jane Walker PhD RN
Aims of Session

- Based on meta-analysis, interpret effect size and clinical significance
  - Types of outcome measures
  - Confidence interval of effect
  - Forest plots and related statistics
  - 2 X 2 tables and related statistics

Outcomes of Meta-Analysis

Combined results of multiple studies → Pooled results

Weighted average treatment result + Variation

Effect Measures

Types of Effect Measures in Meta-Analysis

- Binary
  - Odds ratio, risk ratio, risk difference
- Continuous
  - Mean difference, standardized mean difference
Confidence Intervals

- Common to both types of effect measures
- Range of values containing the true value
  - Usually set at 95%
- The wider the interval, the greater the variability
- In binary outcomes, if confidence interval includes 1 = not statistically significant
- In continuous outcomes, if confidence interval includes 0 = not statistically significant

Forest Plots – Binary Outcomes

![Image of Forest Plot]

Note: Plot truncated due to length

Forest Plots – Binary Outcomes

![Another Image of Forest Plot]

Note: Plot truncated due to length
Expressing Benefits of a Therapy

- Relative risk reduction (RRR) – the difference in experimental event rates as a proportion of the control. Expressed as a percentage.
  - Control event rate (CER) – occurrence of event in control group
  - Experimental event rate (EER) – occurrence of event with treatment
  - RRR = (CER – EER)/CER
Expressing Benefits of a Therapy

- Absolute Risk Reduction (ARR) – the difference in event rates between the experimental group and control group. Expressed as a percent.
  - ARR = CER – EER
- Numbers needed to treat (NNT) – the number of patients who would need to be treated for ONE to show an effect
  - 1/ARR X 100

2 X 2 Tables and Clinical Significance

Example using Rice et al (2013) findings related to high intensity smoking cessation interventions

<table>
<thead>
<tr>
<th></th>
<th>Events</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Treatment</td>
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<td>7609</td>
</tr>
<tr>
<td>Control</td>
<td>803</td>
<td>5979</td>
</tr>
</tbody>
</table>

Translating Meta-Analysis for Clinical Decision Making

Lisa Hopp PhD RN FAAN
Key Issue
Knowledge Translation  Knowledge Transfer
Research Utilization  Knowledge Exchange
Knowledge  Action
Dissemination  Implementation
Diffusion

Distillation-Knowledge Funnel
Primary Inquiry
Syntheses
Knowledge tools
1st gen
2nd gen
3rd gen

CNS as Knowledge Broker
• Distiller
• Context expert
• Custom designer
• Linker
• Capacity builder
• Relationship/network developer
Try this PICO:

- What is the effect of non-invasive positive pressure ventilation vs. standard and usual practice on the need for intubation in patients with exacerbation of COPD?
Interrogate the Forest Plot

- What is the level of measurement for this outcome?
- What statistic is calculated?
- Which 2 studies contributed most to the pooled result?
- Which trial had the greatest variability?
- Was there significant heterogeneity amongst the trials? (p<.1)
- Does the intervention work?

Risk Ratio

Problem: What is the effect of non-invasive positive pressure ventilation vs. usual care on intubation in patients with exacerbation of COPD

- RR = .42
- .33-.53 (95% CI)

Translate

RR = .42 (.33-.53, 95% CI)

- 100% x (1-RR)
- 100 x (1-.42)=58%
- The probability of intubation is decreased 58% when patients use Non-invasive positive pressure ventilation compared with standard and usual treatment
As a Picture

- RR = .42
- .33-.53 (95% CI)

Breathing Mask Decreases Chance of Breathing Tube

Try this

- PICO: What is the effectiveness of discharge planning interventions involving at least one nurse on health-related outcomes for elderly inpatients discharged home?

Interrogate the Forest Plot

- What is the level of measurement for this outcome?
- What statistic is calculated?
- Which studies contributed most to the pooled result of each subgroup?
- Which trial had the greatest variability?
- Was there significant heterogeneity amongst the trials in the subgroup? In the overall?
- Does the intervention work?

Translate

- For Clinicians

- For Patients and families: