Section 2.2

Knowledge Synthesis

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Definitions*

- Knowledge syntheses (KS) consist of a clearly formulated question and use systematic and explicit methods to identify, select, critically appraise, and interpret data from relevant research.
- A meta-analysis is a statistical technique used to quantitatively integrate the results of included studies in a KS.
- A KS does not necessarily include a meta-analysis.

* From The Cochrane Collaboration
Knowledge Synthesis

• KS is used to interpret individual study results within the context of global evidence
• KS can be used as a starting point for practice guidelines and new primary research (e.g. trials)
• KS bridges the gap between research and decision-making
Types of Evidence

• Many groups worldwide conduct KS and methods involved usually depends on the question(s) being considered
  – Questions regarding the effectiveness of interventions will usually include quantitative evidence (e.g. odds ratio for a particular drug versus placebo)
  – Contextual questions about why an intervention worked in a particular context will usually include qualitative evidence
General Methods of a KS

• Incorporating qualitative evidence into KS can be:
  – Challenging
  – Difficult to locate qualitative evidence
  – Difficult to integrate qualitative evidence with quantitative evidence
  – Methods are just emerging

• As such, the focus will be on general methods applicable to most KS
General Methods of a KS

Overview:

- Assembling the review team
- Formulating the question, protocol, and eligibility criteria
- Identifying relevant studies
- Selecting studies
- Risk of bias assessment
- Data extraction
- Data analysis
- Presenting results
- Interpreting results
The Review Team

- Determined by the question
- May include the following people:
  - Clinical experts with knowledge of the topic
  - Methodologists who know the KS process
  - Librarian to help locate relevant studies
  - Researchers who conducted studies on the topic
  - Funder or commissioning agency for context
  - Statistician if meta-analysis is being considered
  - End-users (e.g. policy makers, patients) to increase relevance and uptake
Formulating the Question

- Most important step because it guides the KS process
- PICO(S or T): Population, Intervention, Comparators, Outcome, and (Study design or Time period) facilitates question development
- May not fit all KS (e.g. *Intervention* sometimes replaced by *Exposure*) but still useful template to consider
Formulating the Protocol

• Pre-specifies the review process
• Important because it decreases *post-hoc* changes to methods and selective outcome reporting
• Elements include primary versus secondary outcomes, search methods, appraisal of the literature, and data abstraction
• Any changes to the protocol should be transparently reported in the review write-up
Formulating the Eligibility Criteria

- Should extend from the question
- Based on PICO(S or T)
- Consider language of publication
- Consider publication status (e.g. published vs. unpublished material)
- Needs to be thoroughly considered, properly defined, and transparently reported
Identifying Relevant Studies

• Based on the question and PICO(S or T)
• MEDLINE, EMBASE, and The Cochrane Library electronic databases are commonly used for health-related research
• At least 2 relevant databases should be searched
• Advisable that a librarian guides this process
• Should search for unpublished and difficult to locate (i.e. grey) literature (e.g. trial registries, public health agency websites)
Selecting Studies

• Based on the eligibility criteria
• 2 stages: broad screening of titles and abstracts and stricter screening of potentially relevant full-text articles
• 2 independent reviewers should screen at all levels to ensure relevant studies aren’t missed
• Agreement between reviewers can be assessed using the kappa statistic
Risk of Bias Assessment

• Many assessment tools have been developed to assess the risk of bias for different study designs
• Only reporting a summary score is not advisable; the assessments for each criterion from the quality appraisal should be reported for each study
• Sensitivity analyses on risk of bias can be conducted versus excluding studies based on risk of bias
Data Extraction

• Primary outcomes should be differentiated from secondary outcomes
• Data extraction form(s) should be developed \textit{a priori} and pilot-tested to increase reliability
• Potential errors are decreased if more than one reviewer independently extracts the data
• Authors of included studies should be contacted for missing or unclear information
Data Analysis

• Depends on the question and type of data collected
• All KS must have a narrative synthesis of results and risk of bias
• Standard effect measures (e.g. odds ratios, hazard ratio) may be used
• Meta-analysis may not be possible or advisable if outcomes were assessed inconsistently and clinical, methodological or statistical heterogeneity is observed
Presenting Results

• Screening process should be described in the text and/or presented as a flow-chart
• Characteristics of included studies should be described in the text and/or a table (e.g. participant populations, interventions)
• Results of risk of bias assessments should be presented in a table and/or text
• Quantitative data should be presented as summary data (e.g. effect estimates with confidence intervals for each study) and may be presented for each outcome in a table or in a forest plot figure
• Qualitative data can be presented visually (e.g. conceptual framework)
Interpreting Results

• Discuss risk of bias, strength, and applicability of the evidence for each outcome

• Relevance of the results should be considered for key stakeholders to increase applicability

• Qualitative evidence can help explain how the intervention worked and whether it will work in a different setting

• Should consider study and KS limitations
Disseminating Results

• Most common form of dissemination is publication in peer-reviewed journals
  – Open access journals will increase dissemination

• Targeted dissemination via media for the public, brief reports for health care providers, policy makers and consumers, and decision-aids for patients
Uptake of Results

• Much attention has been paid to enhancing the quality of KS but relatively little has been done regarding the format for presentation to enhance uptake

• Resources are available to make KS more user-friendly (e.g. Clinical Evidence: [http://clinicalevidence.bmj.com/ceweb/index.jsp](http://clinicalevidence.bmj.com/ceweb/index.jsp) and Program in Policy Decision-Making/Canadian Cochrane Centre database: [http://www.researchtopolicy.ca/Search/Reviews.aspx](http://www.researchtopolicy.ca/Search/Reviews.aspx))
Future Research

• Increasing the uptake of KS
• How best to update KS
• Comparability between different types of KS (e.g. rapid reviews versus conventional reviews)
• How to prioritize KS topics
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