Living Systematic Reviews: Principles and progress

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6th International Initiative for Traumatic Brain Injury Research (InTBIR) Meeting,
October 30-31 2017, Washington DC
Disclosures
Why knowledge synthesis is important?

Evidence based practice research: Pyramid of evidence
Why conducting knowledge synthesis research?

• Provide the best evidence currently available

• Helpful for clinical decision-making context
  • Guidelines development
What is a systematic review?

“A systematic review attempts to collate all empirical evidence that fits pre-specified eligibility criteria in order to answer a specific research question.

It uses explicit, systematic methods that are selected with a view to minimizing bias, thus providing more reliable findings from which conclusions can be drawn and decisions made.”

Oxman 1993
What is the current ecosystem for conducting systematic reviews?
What is a living systematic review (LSR)?

“A systematic review that is continually updated, incorporating relevant new evidence as it becomes available”

Elliott et al. *Journal of Clinical Epidemiology* 2017
### How LSR differ from other types of reviews?

<table>
<thead>
<tr>
<th>Feature</th>
<th>Living systematic reviews</th>
<th>Frequently updated systematic reviews</th>
<th>Rapid reviews</th>
<th>Standard systematic reviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explicit methods for “when” and “how” of updating</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Continuous surveillance in the databases for new articles</td>
<td>Yes</td>
<td>?</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>New evidence rapidly incorporated and published</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Using standard methodologies of systematic review</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Cochrane Canada Symposium
LSR Workshop - May 2017

• LSR network created – joined Australian/Canadian initiative

• Development of methods guidelines
What is the process for conducting a LSR?

Elliott et al. Journal of Clinical Epidemiology 2017
When should we perform a LSR?

• A LSR is not always appropriate

• Should be initiated when:
  • High priority for decision-making
  • Uncertainty in the existing evidence
  • New research evidences are about to emerge in this field
How to perform a LSR?

• Uses the standard methods for conducting SR
• Should be describe explicitly in the protocol
• If changes occur in the methodology, should be stated in the LSR and in an accessible review protocol
• Ongoing or frequent searches (monthly) in the databases using auto alerts or manual search
• Updating analyses, findings and conclusions
How to perform a LSR?

• If new studies are found: integrate now or later (negligible effects on the evidence)
• Peer review of the protocol and initial LSR
• Should use a publication format that can be easily updated
What are the most developed format so far?

Creating trustworthy guidelines, evidence summaries and decision aids that we can all use and share

WikiRecs* and BMJ RapidRecs
Trustworthy recommendations

Rapid creation and dissemination of trustworthy recommendations to the point of care: Collaborative network approach

* Wiki (means rapid in Indonesian) Recommendations and evidence summaries
What are the main issues with conducting LSR?

• LSR is an ongoing process that take time and resources
• Time consuming and human resources intensive
  • Ongoing or frequent searches in the databases for new articles to keep the systematic review up-to-date
• On a regular basis:
  • Performing new analyses
  • Updating results and conclusions
  • Updating meta-analysis
How to make it feasible?

• Opportunities for automation and machine learning technologies

• Separate tasks into microtasks as well as using technological tools can help make the process more efficient

• Machine automation can help with running searches in the different databases, eligibility assessment, data extraction, assessment of risk of bias and synthesis

Thomas et al. *Journal of Clinical Epidemiology* 2017
LSR in TBI initiative within InTBIR

• Collaborative efforts
  
  • CENTER TBI
  • Canada Research Chair in Critical Care Neurology and Trauma
  • CIHR Foundation Scheme grant
  
  • Cochrane Australia
  • Cochrane Canada
  • LSR methods groups in Australia and Canada
LSR in TBI initiative within InTBIR

- Collaborative efforts
  - Identification of questions of interests with clinical equipoise
  - LSR team and Living guidelines team
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# Living systematic review - Resources

**Cochrane Community**

**Living systematic reviews**

- **Enhanced Cochrane Library project**
- **Cochrane Review Ecosystem**
- **Production resources**
  - Proposing and registering new Cochrane Reviews
  - Editorial and Publishing Policy Resource (EPPR)
  - Fast Track editorial process
  - Living systematic reviews
  - MECIR
  - Prioritization work by Cochrane Review Groups
  - Plain Language Summaries

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**Breaking News**

Now 3 Living systematic reviews on the Cochrane Library!

Living systematic review series published in *Journal of Clinical Epidemiology*

- What is a living systematic review?
- Why living systematic reviews?
- Living systematic review pilots

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**Living systematic review**

A systematic review that is continually updated, incorporating relevant new evidence as it becomes available.

[cochrane.org/lsr]

180+
LSR NETWORK MEMBERS

3
LSRs PUBLISHED ON COCHRANE LIBRARY

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[www.ulaval.ca](http://www.ulaval.ca)
When and how long should we be updating meta-analyses?

• Frequent updates are needed in order to provide the best available evidence
• Just like the LSR, meta-analyses included in these reviews need to be updated frequently
• When to stop? If too early, there’s a risk of error
• Results may change when new studies are published
Updating meta-analyses

• Two reasons to perform a LSR:
  • Provide the best evidence currently available
  • Helpful for clinical decision-making context

Living systematic reviews on the Cochrane Library

Delayed antibiotic prescriptions for respiratory infections

Abstract
Background

Concerns exist regarding antibiotic prescribing for respiratory tract infections (RTIs) owing to adverse reactions, cost, and antibacterial resistance. One proposed strategy to reduce antibiotic prescribing is to provide prescriptions but to advise delay in antibiotic use with the expectation that symptoms will resolve first. This is an update of a Cochrane Review originally published in 2007, and updated in 2010 and 2013.

Editorial note: As a living systematic review, this review is continually updated, incorporating relevant new evidence as it becomes available. Please refer to the Cochrane Database of Systematic Reviews for the current status of this review.
Basic characteristics of a SR

• Clearly stated set of objectives
• Pre-defined eligibility criteria
• Explicit & replicable methodology
• Systematic search (scientific & grey literature, reference lists of included studies, etc.)
• Assessment of the validity of the findings (risk of bias, GRADE, etc.)
• Systematic presentation & synthesis of the characteristics and findings
How to perform a living systematic review?

- Before updating a LSR, questions to ask:
  - Does the published review still address a current question?
  - Review used valid methods & was well conducted?
  - Are there any new relevant methods?
  - Are the any new studies, or new information?
  - Will the adoption of new methods change the findings or credibility?
  - Will the new studies/information/data change the findings or credibility?
Human & Machine technologies

Machine technologies are helpful...
  • Synthesis and reporting
    • Generating sections of an article by using a template predefined (i.e., RevMan)

Thomas et al. (2017). Living systematic reviews: 2. Combining human and machine effort. *Journal of Clinical Epidemiology*
Updating meta-analyses

• If the purpose of the LSR is to provide the best evidence available → standard meta-analysis methods

• If the purpose of the LSR is to help make decisions → used approaches to avoid type I and II errors

Updating meta-analyses

- Four methods used to avoid statistical problems:
  - Type I error:
    - Law of the iterated logarithm
    - Shuster method
  - Type I & II errors
    - Trial sequential analysis
    - Sequential meta-analysis

# Updating meta-analyses

## Key properties of the updating methods

<table>
<thead>
<tr>
<th></th>
<th>Trial sequential analysis</th>
<th>Sequential meta-analysis</th>
<th>Shuster</th>
<th>Law of the iterated logarithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrects for type I error</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Ye</td>
</tr>
<tr>
<td>Corrects for type II error</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Assumed effect size and statistical power required</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Need to specify number of updates</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Adjusts information/sample size for heterogeneity</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Adjusts for misestimation of heterogeneity</td>
<td>No</td>
<td>Optional</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Publication of a living systematic review - Issues

• Do we need to update the entire article or just a few sections?

• How can we inform readers with the update?
  • Using CrossMark?
  • Indicate the version in the digital object identifier (DOI) (i.e., .pub3)?
  • Put an explicit link in the database (i.e., Update or: Cochrane Database Syst Rev. 2005;(2):CD005283)?
  • A “what’s new” section?