WHEN & HOW TO UPDATE SYSTEMATIC REVIEWS: A METHODOLOGICAL SYSTEMATIC REVIEW

Alexander Tsertsvadze, David Moher, Andrea Tricco, Martin Eccles, Jeremy Grimshaw, Margaret Sampson, Nick Barrowman

IMPORTANCE OF SRs

- Commissioning agencies and other groups are investing in SRs

- Healthcare professionals increasingly rely on results of SRs

- About 2500 new SRs published annually (Moher et al., In revision)

- The development of CPGs often involves evidence from SRs

- Utility of SRs optimal when kept up-to-date

WHY THERE IS A NEED TO UPDATE?

New evidence

- Emergence of new interventions and new outcomes

- Studies of new populations

- Knowledge on benefits/harms of existing interventions may change

- Obtain missing/more detailed data (contacting authors of primary studies)

Consequences

- SRs not incorporating new evidence may not be valid

- CPGs misleading if based on outdated evidence

STRENGTHS OF UPDATING

- Keeps users up-to-date with new developments (e.g., new interventions, outcomes) in a given field

- Monitors changes of the effect of intervention (by adding new studies)

- Minimizes the impact of publication bias due to delayed publication or unpublished literature

- Reduces statistical/clinical uncertainty

- Allows to extend the search strategy (additional databases/other sources)

CHALLENGES RELATED TO UPDATING

- How to update (protocol, update search, statistical considerations)

- When to update (frequency, timing, fast/slow evolving fields, efficiency)

- Inconsistent perception of updating process (non-comparability across surveys of updating practices, prevalence of updated SRs)

- Cost, time, feasibility

SR: WHEN AND HOW TO UPDATE

Rationale for SR

- No SR of methods/strategies for updating SRs
- Bring some clarity to the topic and identify gaps in knowledge
- Provide more guidance to systematic reviewers and agencies
- Help to develop effective guidelines for updating SRs

Study objectives

To systematically summarize evidence of methods for updating SRs by addressing two questions:

1. When to update SRs and
2. How to update SRs

WHAT IS AN UPDATE?

Working definition

A discrete event aiming to search for and identify 'new evidence'

to incorporate it into a previously completed systematic review[1]

- The central element - an effort to search for 'new evidence'

- Even if no 'new evidence', still an update

- Modifications, without initiating a new search, not an update :

  a) Corrections of errors
  b) Re-analysis using modified/new methodology (e.g., statistical pooling)

[1] Moher D, Tsertsvadze A. Systematic reviews: when is an update an update? *Lancet* 2006; 367: 881-883.

SR: WHEN AND HOW TO UPDATE

Search strategy/sources and data extraction

- MEDLINE (OVID 1966 - 2005), PsycINFO (1955 - 2005), the CMR (Issue 1, 2006), reference lists scanned, and Proceedings of the 13th Cochrane Colloquium

- Cross-sectional sample of SRs (n = 297) indexed in MEDLINE November 2004 to identify updated SRs reporting or describing any method/strategy for updating

- 15-item extraction form

SR: WHEN AND HOW TO UPDATE

Identified and included methods/strategies

Search and screening results

- Total of 2548 records (titles and abstracts) identified and screened

- 15 records included (7 methods/strategies)

- Statistical methods (n = 2)

- Strategies (n = 5)

Sample of SRs (n = 297) indexed in MEDLINE (Nov. 2004)

- Updated SRs (n = 54)

- None of the 54 SRs reported any methods/strategies for updating

- All 54 updated SRs were excluded

Statistical methods (I)

Cumulative meta-analysis (CMA) (Baum 1981, Lau 1992)

- A statistical procedure in which the pooled effect estimate is sequentially updated by incorporating results from each newly available study

- Defined as "a product of performing a new meta-analysis every time a new relevant trial is added to a series of trials"

- Updating mechanism; up-to-date information, exploratory tool; early detection of benefit/harm; stopping ongoing/planning future trials

- Not efficient (update whenever a new study emerges); inflated type I error; publication bias

Methodological extensions of conventional CMA

- **Using cumulative slope as an indicator of stability (Mullen 2001)**

  - Least-squares regression line to explore the stability of effect size

  - The slope magnitude close to 0 - stable effect size – no updating

  - Arbitrary; 'no rule of thumb'; SE of slope invalid

- **Using sequential monitoring boundaries (Pogue 1997)**

  - Lan and DeMets α-spending functions to minimize type I error

  - Prior knowledge of the N of the planned tests not required

  - Requires larger amount of data than conventional CMA

- **Recursive CMA (Ioannidis 1999)**

  - Update with a new study/follow-up/more accurate/unpublished data

  - Assess the impact of missing data or publication bias at each step

  - Costly; accuracy of obtained data need to be checked

Statistical methods (II)

Test for identifying 'null' MA that are ripe for updating (Barrowman 2003)

- Identify a null MA that is out of date (i.e., NS result would be overturned)

- Assumes that the pooled effect is NS due to insufficient power

- How many additional subjects are needed to overturn the NS into a S result?

- The observed and predicted numbers of additional subjects compared

- Efficient in determining the proper timing for an update

- Application to a MA of small trials may generate invalid results

SR: WHEN AND HOW TO UPDATE

Strategies for updating SRs (n = 5)

1. Steps in maintaining an updated review (Chalmers 1993)

- Updating strategy for SRs of RCTs evaluating effects of perinatal care (7 steps)

- Identification, retrieval, and incorporation of new information; dissemination

2. Maintaining an updated review (Cochrane Collaboration 2005)

- When registering SRs, authors agree to keep them up-to-date/electronic format

- Periodic (every 2 years) updating of literature search recommended/last search date

3. Assessment of the need to update (Lutje 2005)

- 2-step strategy and algorithm of administrative actions needed for updating

- Decisions based on editorial consensus: a) is SR up-to-date? b) importance of topic

4. Strategies for updating a review (Weller 1998)

- Broadly applicable strategy that considers PH importance, availability of resources

- Clinical outcomes (short-/long-term), health care field (fast/slowly evolving)

5. In-process citations for updating a review (Bergerhoff 2004)

- MEDLINE OVID search by 'entry date' vs. 'publication year' yields additional records

SR: WHEN AND HOW TO UPDATE

Conclusions

- Identified 2 statistical methods and 5 strategies for updating SRs

- Conduct of CMA and its extensions costly/time-consuming; Barrowman's method efficient, but purely statistical; not commonly used

- 5 strategies are either arbitrary, not likely efficient, or not pragmatic; not clear how they would work in practice (not formally tested)

- Importance of updating SRs not well recognized; paucity of updating methods contrasts with quantity of other methodological developments in field of SRs (e.g., publication bias, variance imputation)

- In a recent MEDLINE survey, non-Cochrane reviews accounted for about 80% of all published reviews in November 2004; only about 3% were updated vs. 38% of Cochrane reviews (Moher et al., In revision)

- Cochrane Collaboration and UK's NICE routinely update SRs

Future research and activities

- More investments should be made available to investigate issues surrounding methodology of updating SRs

- Efficient yet comprehensive policies for updating SRs are needed

- Updating process should ideally consider clinical questions, search strategy, public health importance, and statistical techniques in order to accurately reflect the complexity of ever evolving evidence

- Exploring cost-effectiveness of alternative updating techniques or application of methods developed in other fields

- International harmonization of aspects related to updating of SRs

- Electronic publishing formats

Lansdowne