Getting started with systematic reviews

Mark P MacEachern, MLIS
Whitney A Townsend, MLIS
Taubman Health Sciences Library
University of Michigan

http://www.flickr.com/photos/53370644@N06/
Overview

• Why do a Systematic Review?
• What is a Systematic Review?
• Planning a Systematic Review
What is your experience level with systematic reviews?

A. Everyone is asking for them, so I’d better get up to speed
B. Interested in them, but never done one formally
C. Done a few
D. Participated in many
Why do a Systematic Review?
The problem...
Here's What Happens When You Drink Red Wine Every Night

By: [Author]

Health effects of red wine: Where do we stand

By Carina Stors, Special to CNN

Red wine is bad for you, say experts

Government experts dismiss supposed health benefits of wine and are set to rewrite the rule book on alcohol consumption
Dealcoholized red wine decreases systolic and diastolic blood pressure and increases plasma nitric oxide: short communication.
Related citations

Red wine polyphenols do not lower peripheral or central blood pressure in high normal blood pressure and hypertension.

Red wine and beer elevate blood pressure in normotensive men.
Why do a Systematic Review?

To Summarize the Evidence and Answer a Question!
Why do a Systematic Review?

To Summarize the Evidence and Answer a Question!

Policy-making

Further Research

Grants, Research projects, Student projects, More!

Decision-making

https://www.flickr.com/photos/patrickwilken/6093755090
What is a Systematic Review?

Cochrane Collaboration

A systematic review attempts to identify, appraise and synthesize all the empirical evidence that meets pre-specified eligibility criteria to answer a given research question.

Researchers conducting systematic reviews use explicit methods aimed at minimizing bias, in order to produce more reliable findings that can be used to inform decision making. (Antman 1992, Oxman 1993).

www.thecochranelibrary.com/view/0/AboutCochraneSystematicReviews.html
What is a Systematic Review?

Synthesis

Sajid MS, Desai M, Morris RW, Hamilton G. **Knee length versus thigh length graduated compression stockings for prevention of deep vein thrombosis in postoperative surgical patients.** Cochrane Database of Systematic Reviews 2012, Issue 5

Studies


What is a Systematic Review?

Campbell Collaboration

A systematic review uses **transparent procedures** to **find, evaluate and synthesize** the results of relevant research. Procedures are explicitly **defined in advance**, in order to ensure that the exercise is transparent and can be replicated.

Studies included in a review are **screened for quality**, so that the findings of a large number of studies can be combined. **Peer review** is a key part of the process; qualified independent researchers control the author’s methods and results.

www.campbellcollaboration.org/research-resources/writing-a-campbell-systematic-review/systemic-review.html
What is a Systematic Review?

- Qualitative Systematic Review
- Quantitative Systematic Review (aka Meta-analysis)
- Narrative Review
- Scoping Review
- Realist Review
- Meta-synthesis
- Meta-ethnography
- Etc, etc, etc....
What is a Systematic Review?

- Qualitative Systematic Review
- Quantitative Systematic Review (aka Meta-analysis)
- Scoping Review
- Realist Review
- Meta-synthesis
- Meta-ethnography
- Etc, etc, etc....
Standards and Methods

• **PRISMA**  [http://www.prisma-statement.org/](http://www.prisma-statement.org/)


• **Cochrane Handbook**  [http://handbook.cochrane.org/](http://handbook.cochrane.org/)

• **Campbell Collaboration**  [http://www.campbellcollaboration.org/research-resources/writing-a-campbell-systematic-review.html](http://www.campbellcollaboration.org/research-resources/writing-a-campbell-systematic-review.html)

• **Joanna Briggs**  [http://joannabriggs.org/sumari.html](http://joannabriggs.org/sumari.html)

• **BEME**  [http://www.bemecollaboration.org/](http://www.bemecollaboration.org/)
The Systematic Review
Key points

- Literature Search
  - Multiple databases and information sources, including hand-searching
  - Appropriate search terms (controlled and keyword)
  - Identifies any limits applied or search filters used

- Study Selection
  - At least 2 people screening results, blinded
  - Clearly defined inclusion and exclusion criteria

- Study Appraisal
  - At least 2 people appraising articles
  - Assess the risk of bias, using predefined criteria

- Data Extraction & Analysis
  - At least 2 people independently extracting data
  - Use standard extraction form
  - Conduct qualitative synthesis (and quantitative if appropriate)

- Presenting Results
  - Reports all steps in the process according to PRISMA or IoM (or others) standards
  - Utilizes appropriate images (graphs, tables, etc.) to describe process and results
  - Includes supplemental materials with additional details for replicability
1. Transparent
2. Replicable
Planning your Systematic Review

what people think it looks like
what it really looks like

Success

Martin D. *This Is a Book*. New York: Grand Central Publishing; 2012.
The Systematic Review Protocol

A protocol is a plan or set of steps to be followed in a study. A protocol for a systematic review should describe the rationale for the review; the objectives; and the methods that will be used to locate, select and critically appraise studies, and to collect and analyse data from the included studies.

JUST TAKE DEEP BREATHS

IT'S ALL RIGHT

http://calmingmanatee.com/2
• Who is involved
• Why a Systematic Review
• Question(s)
• Search parameters
• Appraisal
• Analysis
• Writing
• Timeline

https://www.flickr.com/photos/13519089@N03/1380483002
Distribute your work
Inform your search
Educate your team

Distribute your work
Inform your search
Educate your team
Educate team members on proper systematic review methodology

The Big Question...

DO YOU REALLY WANT TO DO

A SYSTEMATIC REVIEW?
Educate team members on proper systematic review methodology

DO YOU **REALLY** WANT TO DO A SYSTEMATIC REVIEW?

- Standards: PRISMA, Cochrane, National Academies (IoM), Campbell, Joanna Briggs, etc.


Educate team members on proper systematic review methodology

Suitability of the question

Does the review explicitly address a sensible question?

• Is the underlying biology or sociology such that, across the range of interventions and outcomes included, the effect should be similar?
  – Interventions standardized and similar
  – Populations similar
  – Outcomes of interest

• Does the review include explicit and appropriate eligibility criteria?
  – Population
  – Study design
  – Etc.

• What is the impact of this question?
  – Who cares?
  – How will this impact care/practice/decision-making/policy-making/future research?
Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomised controlled trials.

Smith GC, Pell JP

Abstract

OBJECTIVES: To determine whether parachutes are effective in preventing major trauma related to gravitational challenge.

DESIGN: Systematic review of randomised controlled trials.

DATA SOURCES: Medline, Web of Science, Embase, and the Cochrane Library databases; appropriate internet sites and citation lists.

STUDY SELECTION: Studies showing the effects of using a parachute during free fall.

MAIN OUTCOME MEASURE: Death or major trauma, defined as an injury severity score > 15.

RESULTS: We were unable to identify any randomised controlled trials of parachute intervention.

CONCLUSIONS: As with many interventions intended to prevent ill health, the effectiveness of parachutes has not been subjected to rigorous evaluation by using randomised controlled trials. Advocates of evidence based medicine have criticised the adoption of interventions evaluated by using only observational data. We think that everyone might benefit if the most radical protagonists of evidence based medicine organised and participated in a double blind, randomised, placebo controlled, crossover trial of the parachute.

Republished in
Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomised controlled trials. [Int J Prosthodont. 2005]

PMD: 14684649    PMCID: PMC300888    DOI: 10.1136/hmt.327.7429.1459

[Indexed for MEDLINE]    Free PMC Article

Images from this publication.    See all images (1)    Free text
Educate team members on proper systematic review methodology

Resource Availability

https://www.flickr.com/photos/dottiemae/5311528896
Inform your search process

Identify questions

• PICO (or similar) format if possible
  – CLIP, ECLIPSE, MIP, PICO, SPICE, SPIDER

• Often multiple questions

• Keep the search from getting out of hand

• Identify areas you need clarification
  – Ex., What is meant by “bullying”? (physical, mental, accepted definitions, characteristics, etc.)
Inform your search process

Formulating searches

• Appropriate resources
• Search terminology
• Additional search expertise
• Limits, filters, etc.
Getting it done and published

Framework for final publication

Follow accepted standards of journals

Full team member = co-author!

https://www.flickr.com/photos/96dpi/1063145950
Part 2: Systematic Review Teams, Roles, & Tasks
Team members and roles

From Cochrane (2.3.4.1)

- Essential teams have more than one person
- Ensures tasks can be completed by at least two people independently
- Team members
  - Topic expert
  - Systematic review methodology expert
  - Statistician
  - Healthcare consumers

Source: http://handbook.cochrane.org/
Team members and roles

From National Academies (2.1)

- Teams should be multidisciplinary to better break from preconceived opinions
- Specifically highlight librarians and information specialists
- Size depends on complexity of topic
- Team members
  - Topic expert
  - Systematic review methodology expert
  - Search expert
  - Statistician
  - Others as appropriate (stakeholders, key users)

Source: https://www.nap.edu/read/13059/chapter/1
## Librarian roles

<table>
<thead>
<tr>
<th>Sources of recommendations and best practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Cochrane Handbook</td>
</tr>
<tr>
<td>○ <a href="http://handbook.cochrane.org/">http://handbook.cochrane.org/</a></td>
</tr>
<tr>
<td>● National Academies</td>
</tr>
<tr>
<td>○ <a href="https://www.nap.edu/read/13059/chapter/1">https://www.nap.edu/read/13059/chapter/1</a></td>
</tr>
<tr>
<td>● Campbell Methods Guide</td>
</tr>
<tr>
<td>○ <a href="https://www.campbellcollaboration.org/media/k2/attachments/1_Searching_for_studies.pdf">https://www.campbellcollaboration.org/media/k2/attachments/1_Searching_for_studies.pdf</a></td>
</tr>
<tr>
<td>● PRISMA</td>
</tr>
</tbody>
</table>
## Librarian roles

<table>
<thead>
<tr>
<th>Common librarian tasks and responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comprehensive search</strong></td>
</tr>
<tr>
<td>● Supplemental searches</td>
</tr>
<tr>
<td>● Citation management</td>
</tr>
<tr>
<td>● Writing search methods</td>
</tr>
<tr>
<td>● Other considerations</td>
</tr>
</tbody>
</table>
# Librarian roles

## Common librarian tasks and responsibilities

<table>
<thead>
<tr>
<th>● Comprehensive search</th>
<th>● Balance comprehensiveness with precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Supplemental searches</td>
<td>○ Focus on titles and abstracts, generally</td>
</tr>
<tr>
<td>● Citation management</td>
<td>○ Use proximity operators</td>
</tr>
<tr>
<td>● Writing search methods</td>
<td>● Start with sentinel articles</td>
</tr>
<tr>
<td>● Other considerations</td>
<td>○ Term generation</td>
</tr>
<tr>
<td></td>
<td>○ Test searches</td>
</tr>
<tr>
<td></td>
<td>● Select appropriate databases</td>
</tr>
<tr>
<td></td>
<td>● Use keywords and controlled terms</td>
</tr>
<tr>
<td></td>
<td>● Use Boolean operators appropriately</td>
</tr>
<tr>
<td></td>
<td>● Identify synonyms</td>
</tr>
<tr>
<td></td>
<td>● Avoid filters whenever possible</td>
</tr>
<tr>
<td></td>
<td>● Seek another set of eyes (PRESS)</td>
</tr>
</tbody>
</table>

**Note**

- Make searches reproducible
## Librarian roles

### Common librarian tasks and responsibilities

<table>
<thead>
<tr>
<th>Comprehensive search</th>
<th>Grey literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplemental searches</td>
<td>Conference proceedings</td>
</tr>
<tr>
<td>Citation management</td>
<td>Ongoing and unpublished clinical trials</td>
</tr>
<tr>
<td>Writing search methods</td>
<td>Government reports</td>
</tr>
<tr>
<td>Other considerations</td>
<td>Dissertations</td>
</tr>
</tbody>
</table>

- Handsearching relevant journals
- Forward and backward citations
- Conversations with experts

**Note**
- Most citations should come from main database searches, usually
### Librarian roles

<table>
<thead>
<tr>
<th>Common librarian tasks and responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Comprehensive search</td>
</tr>
<tr>
<td>● Supplemental searches</td>
</tr>
<tr>
<td>● Citation management</td>
</tr>
<tr>
<td>● Writing search methods</td>
</tr>
<tr>
<td>● Other considerations</td>
</tr>
<tr>
<td>● Endnote, RefWorks, Mendeley</td>
</tr>
<tr>
<td>● Use to transfer results to eligibility screeners</td>
</tr>
<tr>
<td>● Use program to eliminate duplicates</td>
</tr>
</tbody>
</table>
## Librarian roles

### Common librarian tasks and responsibilities

- Comprehensive search
- Supplemental searches
- Citation management
- Writing search methods
- Other considerations

- **Authorship or acknowledgement**
  - Refer to ICMJE or journal requirements for authorship

- **See:**
  - PRISMA
  - National Academies (standard 5.1)
  - Cochrane Handbook (section 6.6)
  - Campbell methods guide on systematic reviews (chapter 8)
Librarian roles

Common librarian tasks and responsibilities

- Comprehensive search
- Supplemental searches
- Citation management
- Writing search methods
- Other considerations

In protocol

- Describe intended search strategy
- Include databases and search terms if possible (mandatory for Campbell)

Systematic review of quality improvement initiatives in the intensive care setting

Gordon Sun, Jean Gaines, Rocco Perla, Mark MacEachem, Matthew Davis, William Shrank

Citation

Review question(s)
What are the most commonly tested quality improvement algorithms in the intensive care unit (ICU) setting?
What specific healthcare outcomes are being measured in ICU-related quality improvement initiatives?
Are healthcare institutions able to adequately assess whether an ICU-related quality improvement initiative has been successful or not?

Searches
We will search the following databases: Ovid MEDLINE, EMBASE, CINAHL, ABIINFORM, and the Cochrane Central Register of Controlled Trials (CENTRAL) using appropriately selected keywords (e.g. six sigma, lean management) and MeSH terms (e.g. root cause analysis). There are no publication period limits. All articles must be English-language.
## Librarian roles

### Common librarian tasks and responsibilities

- Comprehensive search
- Supplemental searches
- Citation management
- **Writing search methods**
- Other considerations

### In abstract

- List all databases searched
- Note the dates of the last search for each database and the period searched
- Note any language or publication status restrictions
- List individuals or organizations contacted

### Note

- Include what you can (i.e. within word restrictions)
Librarian roles

<table>
<thead>
<tr>
<th>Common librarian tasks and responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Comprehensive search</td>
</tr>
<tr>
<td>● Supplemental searches</td>
</tr>
<tr>
<td>● Citation management</td>
</tr>
<tr>
<td>● Writing search methods</td>
</tr>
<tr>
<td>● Other considerations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>● List all that was mentioned in the abstract</td>
</tr>
<tr>
<td>● List grey literature sources</td>
</tr>
<tr>
<td>● List journals that were handsearched</td>
</tr>
<tr>
<td>● List supplemental strategies used</td>
</tr>
</tbody>
</table>
## Librarian roles

<table>
<thead>
<tr>
<th>Common librarian tasks and responsibilities</th>
<th>In study flow diagram</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Comprehensive search</td>
<td>• Number of unique records identified by the searches, including the supplemental searches</td>
<td></td>
</tr>
<tr>
<td>• Supplemental searches</td>
<td>• Number of records excluded during screening</td>
<td></td>
</tr>
<tr>
<td>• Citation management</td>
<td>• Number of records retrieved in full text</td>
<td></td>
</tr>
<tr>
<td>• Writing search methods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Other considerations</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**
- Be sure the screeners are aware of the information they need to collect
# Librarian roles

## Common librarian tasks and responsibilities

- Comprehensive search
- Supplemental searches
- Citation management
- Writing search methods
- Other considerations

Source: PMC5240821
# Librarian roles

## Common librarian tasks and responsibilities

<table>
<thead>
<tr>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensive search</td>
</tr>
<tr>
<td>Supplemental searches</td>
</tr>
<tr>
<td>Citation management</td>
</tr>
<tr>
<td>Writing search methods</td>
</tr>
<tr>
<td>Other considerations</td>
</tr>
</tbody>
</table>

### In Appendix
- Full search strategies for each database to avoid interrupting the flow of the text of the review
- Copy and pasted exactly as run, so as to avoid transcription errors

### Note
- Present the strategies in such a way that readers do not have to guess or make assumptions about any aspect of the search
Librarian roles

Common librarian tasks and responsibilities

- Comprehensive search
- Supplemental searches
- Citation management
- Writing search methods
- Other considerations

- Updating searches
- Evaluating results
  - Sentinel articles
  - Test search components

### Searches

<table>
<thead>
<tr>
<th>#</th>
<th>Searches</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>exp peri-implantitis/ or (periimplant* or peri-implant*).tw. or (implant* adj5 (inflamm* or infect* or diseas*)).tw.</td>
<td>16927</td>
</tr>
<tr>
<td>2</td>
<td>exp dental cements/ or cementation/ or ((dent* or tooth or teeth or orthodontic*) adj3 (cement* or adhesive*).tw. or (cement* or screw*) adj3 retain* adj5 (implant* or crown* or restoration* or prosthesis* or reconstruct* or framework*)).tw.</td>
<td>31804</td>
</tr>
<tr>
<td>3</td>
<td>(and/1-2) and english.la.</td>
<td>253</td>
</tr>
<tr>
<td>4</td>
<td>(&quot;26537368* or &quot;25810850' or '23297703&quot;).ui.</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>4 not 3</td>
<td>0</td>
</tr>
</tbody>
</table>
# Librarian roles

## Common librarian tasks and responsibilities

- Comprehensive search
- Supplemental searches
- Citation management
- Writing search methods
- Other considerations

- Updating searches
- Evaluating results
  - Sentinel articles
  - Test search components

![Search History](image)
Final notes

- Librarian involvement in systematic reviews improves methods
  - Koffel 2015, Rethlefsen 2015
- Keep thorough notes
  - Save searches, result numbers, etc.
- Prioritize transparency & reproducibility
- Read systematic reviews from target journals early in process
- Systematic review software
  - DistillerSR, Covidence, Rayyan
Research: Librarian involvement in systematic reviews


Resources 101

Documentation & Tutorials for Core and Common Subject Resources (health focus)

Systematic Review Database Cheat Sheet (health focus)

Subject & Niche Databases (add & edit!)
Recommendations & Standards


Campbell Collaboration (Social sciences) [http://www.campbellcollaboration.org/research-resources/writing-a-campbell-systematic-review.html](http://www.campbellcollaboration.org/research-resources/writing-a-campbell-systematic-review.html)

Joanna Briggs (Nursing & allied health) [http://joannabriggs.org/sumari.html](http://joannabriggs.org/sumari.html)

BEME (Medical education) [http://www.bemecollaboration.org/](http://www.bemecollaboration.org/)

SCIE Systematic Review guidelines (Social work, social care) [http://www.scie.org.uk/publications/researchresources/rr01.pdf](http://www.scie.org.uk/publications/researchresources/rr01.pdf)
PROSPERO - International prospective register of systematic reviews. Available at: http://www.crd.york.ac.uk/PROSPERO/


Arthritis Research UK Primary Care Centre. Systematic review protocol - outline/template. Available at: http://www.crd.york.ac.uk/PROSPERFILES/3611_STRATEGY_20130031.pdf


Books, Guides & Journals


Online Resources

The Pieces of Systematic Review Webinar Series (National Network of Libraries of Medicine) – Margaret Foster
http://nnlm.gov/scr/professional-development/systematic-review-series (FREE)

Introduction to Systematic Review and Meta-Analysis Coursera (Johns Hopkins) www.coursera.org/learn/systematic-review

PRESS (Peer Review of Electronic Search Strategies)

UT MD Anderson Systematic Reviews: Preparing to Search http://mdanderson.libguides.com/systematicreviews
Workshops for Librarians

Systematic Reviews: Opportunities for Librarians – University of Michigan [http://www.lib.umich.edu/systematic-reviews-workshop](http://www.lib.umich.edu/systematic-reviews-workshop) (hybrid online/in-person)


Identifying the Evidence for Systematic Reviews - Centre for Reviews & Dissemination, University of York [http://www.york.ac.uk/crd/training-services/identifying-the-evidence/](http://www.york.ac.uk/crd/training-services/identifying-the-evidence/)

Searching and Beyond – University of Exeter Medical School [http://medicine.exeter.ac.uk/esmi/workstreams/informationscience/teaching/searchingandbeyond/](http://medicine.exeter.ac.uk/esmi/workstreams/informationscience/teaching/searchingandbeyond/)

Systematic Reviews for Librarians – Washington University in St. Louis (currently in pilot stage)
Tools & Tech

Systematic Review Software

• Distiller SR
• Covidence
• Rayyan

Citation Management Software

• Endnote
• Mendeley
• Refworks