Information retrieval for health technology assessment (HTA)
Content of the session

1. Key issues for information retrieval for HTA
2. Steps in systematic literature searches
3. Practical issues and resources to support literature searching for HTA
What’s In It For You?

- Understand search requirements for HTAs
- Learn key issues regarding literature searching for HTA
- Get familiar with services, resources and competencies that are needed for information retrieval for HTA
1. Key issues for information retrieval for HTA
A well conducted literature search is important in order to identify as much relevant research as possible that has been carried out on a particular question.

(Norwegian Knowledge Centre for the Health Services 2013)
Fundamental challenge of searching
How extensive should searches for an HTA be?

“...the aspiration of the HTA literature search should not be comprehensiveness but rather the minimization of bias.”

(Booth 2010)
Where does bias come from?

- Much research is never published (Chan 2012, Glanville 2013)
- Not all research is published in journals
- Not all research published in journals is indexed on major databases
- Not all research that we know is indexed on databases can be easily retrieved by the specific search strategy we develop (Glanville 2013)
Searching seeks to minimize bias

- **Publication bias**
  - Positive trial results are more likely to be published (Glanville 2013)
  - Published trials are generally larger and may show an overall greater treatment effect than trials not published in journals (Hopewell 2007)

- **Language bias**
  - Positive trial results are more likely to be published in English-language publications (Glanville 2013)
Factors which impact on the search approach

- Type of research question:
  - Effects of intervention, Diagnosis, Prognosis, Aetiology, Experiences

- What components of the HTA to be informed:
  - Effects evidence, safety, cost-effectiveness, ethical aspects etc.

- Which study design is appropriate to search for?
  - e.g. systematic reviews, randomized controlled trials, controlled trials, cohort studies etc.
Factors which impact on the search approach - continued

- Topic of interest
- Product type
- Purpose of the project
- Time frame of the work
- Resources that are available
Searches should be as thorough as possible within available resources
Some key concepts

- Transparent
  - Reporting of the search process

- Systematic
  - Where to search
  - How to search

- Adequately comprehensive
  - Product type
  - Time frame of the work
  - Database access / subscriptions
  - Etc.
2. Steps in a systematic search
When do we perform systematic searches?

- Systematic searches are typically performed for the main research questions in an HTA

- **Examples:**
  - All RCTs for medical device X treating indication Y
  - All observational studies using medical device X
  - All economic evaluations addressing device X

(Based on Kaunelis 2011)
Steps in a systematic search

1. Scope and develop the research question
2. Choose relevant databases and sources
3. Develop individual search strategies for the selected sources
4. Review the search results and possibly revise the search strategies
5. Download records and manage the references
6. Document and report the search process
7. Update the searches (as necessary)

(Norwegian Knowledge Centre for the Health Services 2013)
STEP 1: Scope and develop the research question
**Formulation of a focused question**

<table>
<thead>
<tr>
<th>P</th>
<th>Population</th>
</tr>
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<tbody>
<tr>
<td>I</td>
<td>Intervention</td>
</tr>
<tr>
<td>C</td>
<td>Control/comparator</td>
</tr>
<tr>
<td>O</td>
<td>Outcome</td>
</tr>
<tr>
<td>S</td>
<td>Study design</td>
</tr>
</tbody>
</table>

**Diagram:**
- **Patient Problem Population**
- **Intervention**
- **Outcome**

**Key:**
- **P**: Population
- **I**: Intervention
- **C**: Control/comparator
- **O**: Outcome
- **S**: Study design
Is there an existing evidence synthesis?

- Finding existing and ongoing HTAs, systematic reviews and other evidence syntheses
- Estimating the size of the literature
- Some examples of sources:
  - Clinical Evidence
  - UpToDate
  - Turning Research into Practice
  - Cochrane Database of Systematic Reviews
  - Database of Abstracts of Reviews of Effects (DARE)
  - Health Technology Assessment Database (HTA)
  - Websites of HTA centres
  - PROSPERO
Developing an HTA protocol

- Estimating the resources required for a full HTA or a rapid HTA

- Developing the description of the planned search for inclusion in the HTA protocol
STEP 2: Choose relevant databases and sources
- Outlining some key databases and sources
Databases containing evidence syntheses

Cochrane Database of Systematic Reviews (CDSR)

Database of Abstracts of Reviews of Effects (DARE)

Health Technology Assessment Database (HTA)

PROSPERO
Databases covering specific study type

Controlled trials
- Cochrane Central Register of Controlled Trials (CENTRAL)

Economic evaluations
- NHS Economic Evaluation Database (NHS EED)
- Health Economic Evaluations Database (HEED)
- Paediatric Economic Database Evaluation (PEDE)
- Cost-Effectiveness Analysis Registry (CEA Registry)
General health-related databases

PubMed / MEDLINE

Embase
Subject-specific databases

**Ethics**
- Euroethics

**Mental health**
- PsycINFO

**Nursing and allied health**
- Cumulative Index to Nursing and Allied Health (CINAHL)

**Physiotherapy**
- Physiotherapy Evidence Database (PEDro)
National and regional databases

- **Africa**: African Index Medicus
- **Eastern Mediterranean**: Index Medicus for the Eastern Mediterranean Region
- **Europe**: PASCAL (fee-based)
- **India**: IndMED
- **Korea**: KoreaMed
- **Latin America and the Caribbean**: LILACS
- **South-East Asia**: Index Medicus for the South-East Asia Region (IMSEAR)
- **Western Pacific**: Western Pacific Region Index Medicus (WPRIM)
Citation indexes

Science Citation Index

Scopus

“It is a way of searching forward in time from the publication of an important relevant article to identify additional relevant articles published since then.” (Lefebvre 2008)
Research projects

Research published in journals

Journals recorded in databases

Records retrieved by a search

Records retrieved by search

Journals NOT recorded in databases

Publications NOT recorded in databases

Records NOT retrieved by search

Records retrieved by a search

Publications recorded in databases

Recorded NOT retrieved by search

Other publications

Unpublished research

Source: Julie Glanville, York health Economics Consortium
julie.glanville@york.ac.uk
Grey literature sources

Grey literature databases
  – The OAIster® database
  – OpenSIGLE

Dissertations theses databases
  – ProQuest Dissertations & Theses Database

Websites of different organizations
Ongoing and unpublished studies

**Trials registers**
- International Clinical Trials Registry Platform Search Portal (WHO)

**Trials results registers**
- ClinicalTrials.gov

**Regulatory agencies**
- FDA website

**Manufacturers’ websites**

**Study reports from manufacturers (on request)**

**Conference proceedings**
- BIOSIS, Embase
Supplementary search methods

- Browsing the reference lists of included studies
- Handsearching
- Related citations
- Author searching
- Internet search
STEP 3: Develop individual search strategies for the selected sources
Plan your search

- Identify **major ideas** (key concepts) in your topic sentence
- Find **English terms** for these key concepts
- Think of **synonym terms** to describe these key concepts
Where to find search terms?

- Colleagues and experts on the subject
- Journal articles or books on the same subject
- Scope notes of database subject headings (PubMed MeSH database)
- Dictionaries - Medline Plus Medical Dictionary (http://medlineplus.gov/)
- Wikipedia
Author(s): Sampanthavivat M, Singkhwa W, Chaiyakul T, Karoonyawanich S, Ajpru H.

Title: Hyperbaric oxygen in the treatment of childhood autism: a randomised controlled trial.


Publication year: 2012

Abstract: Promising results with hyperbaric therapy for children with autism have been reported, but most involved the use of only mild pressure with oxygen supplementation. To date, there has been no randomised, blinded trial of....

Subject heading(s): Autistic Disorder/psychology; Autistic Disorder/therapy*; Child; Double-Blind Method; Hyperbaric Oxygenation/methods*; Prospective Studies
“The two search strategies **complemented each other** and **should be used together for maximal retrieval**. No combination of MeSH terms could provide comprehensive yet reasonably precise retrieval of relevant articles. The text-word searching had sensitivity and specificity comparable to the subject search.”
(Jenuwine 2004)
Subject headings

Advantages

- Preferred terms - cover synonyms and variant spellings

Challenges

- Insufficient indexing
- Introduction of new subject headings: no re-indexing of old records
- No adequate subject heading for a topic
Subject headings for *house calls*

- **Medical Subject Headings (MeSH)**
  - PubMed/MEDLLINE, Cochrane Library
  - House Calls

- **Emtree**
  - Professional practice

- **CINAHL Subject Headings**
  - Home Visits

- **Thesaurus of Psychological Index Terms**
  - Home Visiting Programs

- **PubMed/MEDLINE, Cochrane Library**

- **EmBASE**

- **CINAHL**

- **PsycINFO**
**Text words**

**Advantages**
- Compensate for insufficient indexing
- No indexing
- Topic is new
- Topic is rare
- Difficult to find adequate subject headings

**Challenges**
- Text words are more or less arbitrary
- Some references don’t have an abstract
How to combine search terms?

AND

Both words must be present in the document

OR

Either one of the words must be present in the document

NOT

You want to find documents which contain the first word, but NOT the second word
## From PICO to search strategy

<table>
<thead>
<tr>
<th>Population / problem / patient</th>
<th>Intervention</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient</td>
<td>Intervention</td>
<td>Outcome</td>
</tr>
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<td>Patient</td>
<td>Intervention</td>
<td>Outcome</td>
</tr>
<tr>
<td>Patient</td>
<td></td>
<td>Outcome</td>
</tr>
</tbody>
</table>

OR

AND
"Recipe"

1. Patient term 1
2. Patient term 2
3. Patient term 3
4. 1 OR 2 OR 3

5. Intervention term 1
6. Intervention term 2
7. Intervention term 3
8. 5 OR 6 OR 7

9. Outcome term 1
10. Outcome term 2
11. Outcome term 3
12. 9 OR 10 OR 11

13. 4 AND 8 AND 12
**Left ventricular assist device (LVAD) as destination therapy for patients with end-stage heart failure**

<table>
<thead>
<tr>
<th>P</th>
<th>I</th>
<th>C</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult patients (18 years and over) with end-stage heart failure</td>
<td>Left ventricular assist device (LVAD)</td>
<td>Optical medical treatment</td>
<td>Mortality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heart transplantation</td>
<td>Quality of life</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comparison with another type of LVAD</td>
<td>Complications</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Costs</td>
</tr>
</tbody>
</table>

**Search terms**

- Heart failure(s)
- Cardiac failure(s)
- Myocardiac failure(s)
- Heart-assist device(s)
- Heart-assist pump(s)
- Heart-assist system(s)
- Ventricular assist device(s)
- LVAD(s)
- VAD(s)
- VAS(s)
- LVAS(s)
Search strategy

1. Heart failure*
2. Cardiac failure*
3. Myocardiac failure*
4. 1 OR 2 OR 3

5. Heart-assist device*
6. Heart-assist pump*
7. Heart-assist system*
8. Ventricular assist device*
9. LVAD*
10. VAD*
11. LVAS*
12. VAS*
13. 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12

14. 4 AND 13
”I found 5000 references!”
STEP 4: Review the search results and possibly revise the search strategies
What are search filters?

- Search terms /strategies to identify a topic or aspect
  - Study design (RCTs or economic evaluations)
  - Age group (children or the elderly)

- Developed for repeated use
What does a typical search filter look like?

1. randomized controlled trial.pt.
2. controlled clinical trial.pt.
3. randomized.ab.
4. placebo.ab.
5. clinical trials as topic.sh.
6. randomly.ab.
7. trial.ti.
8. 1 or 2 or 3 or 4 or 5 or 6 or 7
9. exp animals/ not humans.sh.
10. 8 not 9

(Lefebvre 2008)
“Recipe”

1. Patient word 1
2. Patient word 2
3. Patient word 3
4. 1 OR 2 OR 3

5. Intervention word 1
6. Intervention word 2
7. Intervention word 3
8. 5 OR 6 OR 7

9. Outcome word 1
10. Outcome word 2
11. Outcome word 3
12. 9 OR 10 OR 11

13. 4 AND 8 AND 12

14. Search filter
15. 13 AND 14
Visual Example of Typical Search Strategy

(Based on Kaunelis 2011)
Clinical queries

PubMed
PubMed comprises more than 23 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full-text content from PubMed Central and publisher web sites.

Using PubMed
- PubMed Quick Start Guide
- Full Text Articles
- PubMed FAQs
- PubMed Tutorials
- New and Noteworthy

PubMed Tools
- PubMed Mobile
- Single Citation Matcher
- Batch Citation Matcher
- Clinical Queries

More Resources
- MeSH Database
- Journals in NCBI Databases
- Clinical Trials
- E-Utilities
- LinkOut

You are here: NCBI > Literature > PubMed

GETTING STARTED
NCBI Education

RESOURCES
Chemicals & Bioassays

POPULAR
PubMed

FEATURED
Genetic Testing Registry

NCBI INFORMAT
About NCBI
A prospective analysis of independent patient risk factors for middle ear barotrauma in a multiplace hyperbaric chamber.

The intravenous perfluorocarbon emulsion Oxycyte does not increase hyperbaric oxygen-related seizures in a non-sedated swine model.

The Effect of Hyperbaric Oxygen on Persistent Postconcussional Symptoms.

Effects of stromal cell derived factor-1 and CXCR4 on the promotion of neovascularization by hyperbaric oxygen treatment in skin flaps.

A systematic review of factitious decompression sickness.

Wound healing: the evidence for hyperbaric oxygen therapy.

Hyperbaric oxygen therapy for Bell’s palsy.

Multi-intervention management of calciphylaxis: a report of 7 cases.

Hyperbaric oxygen in the critically ill.
Weaver LK.

Effect of hyperbaric oxygen treatment on transcriptional factors in regenerating rat tail.

Changes in inflammatory gene expression by hyperbaric oxygen treatment in human endothelial wound conditions.

Reduction of apoptosis in ischemic retina models using hyperbaric oxygen treatment.
Challenges with search filters

- Absence of specific publication type (e.g. diagnostic test accuracy study, economic evaluation)

- Unsufficient indexing; wrong indexing

- Poor reporting of studies

- Inconsistent terminology

- High sensitivity filters tend to have low precision
STEP 5: Download records and manage the references
Reference management software

When handling large amounts of references a reference management software is useful. There are several to choose from:

  (works with Firefox web browser)

* = free of charge
Reference management software enables you to...

- Create a reference database specific to a research project at hand and keep references organized
- Import references from various databases
- Remove duplicates
- Generate reference lists
- Create in-text citations and bibliographies when writing thus making it easier to produce an HTA report
- Keep track of the review process: which articles have been excluded, ordered in fulltext etc.
The Use of Cortical Auditory Evoked Potentials to Evaluate Neural Encoding of Speech Sounds in Adults

Katrina Agung, Suzanne C. Purdy, Catherine M. McMahon, Philip Newall

Abstract

There has been considerable recent interest in the use of cortical auditory evoked potentials (CAEP) to investigate the neural encoding of speech sounds. This interest has focused on the use of CAEP to examine the neural mechanisms underlying speech perception and production. CAEP have been used to study the neural encoding of speech sounds in adults as well as children. The purpose of this study was to investigate the use of CAEP to evaluate neural encoding of speech sounds in adults. The results of the study showed that CAEP were sensitive to the neural encoding of speech sounds in adults. This suggests that CAEP may be a useful tool for investigating the neural mechanisms underlying speech perception and production in adults.
STEP 6: Document and report the search process
It is important to log the choices one makes during the search process (selection of sources, search terms and the combination of search terms)

Providing the full detail of strategies enables readers to evaluate them

“The search process should be as transparent as possible and documented in a way that enables it to be evaluated and reproduced”
(Centre for Reviews and Dissemination 2009)
Reporting searches

- Methods section:
  - (PICO) concepts that were searched for
  - List of all databases searched
  - Information of other sources searched
  - Date of search
  - Limits applied
  - Cross-reference to the search strategies in the appendix

- The complete search strategies for each database in the appendix (including database name, search date and number of hits)
STEP 7: Update the searches (as necessary)
Depending on the scope and timescale of the evidence synthesis, an update of the literature searches towards the end of the project may be required.
3. Practical issues and resources to support literature searching for HTA
Who are “Systematic Searchers”?

- Experts in technical and methodological issues of searching (e.g. information specialists, information scientists, research librarians)
- Work closely with the research team at several stages of review

Why are they important?
- Help to minimize potential biases in search
- Know search resources and how to use them
- Can advise on size and quality of search results

(Based on Kaunelis 2011)
Supporting infrastructure

- Database subscriptions
- Document acquisition
- Reference management software
- Standard operating procedures

(Voutier 2011)
Database subscriptions

- Free?
- Consortia?
- University affiliations?
- HINARI?
- Institutional licensing
- Individual licensing

(Based on Voutier 2011)
Document Acquisitions

- University affiliations?
- HINARI?
- Membership to document delivery companies
- Author communications
- Open access

(Based on Voutier 2011)
Reference Management Software

- Free services
  - Zotero
  - Mendeley
- University affiliations?
- Software licensing
  - Endnote
  - RefWorks

(Based on Voutier 2011)
Standard Operating Procedures

- SOP = guidelines
  - Who does what
  - What to do in certain circumstances e.g. rapid review
  - Where files are kept
  - How processes are documented

(Voutier 2011)
Resources and guidance

- handbooks
- web resources
- search filter websites
- training opportunities

(Based on Voutier 2011)
Handbooks

- Cochrane Handbook for Systematic Reviews of Interventions
  http://www.cochrane-handbook.org/

- Systematic Reviews: CRD’s guidance for undertaking reviews in health care
  http://www.york.ac.uk/inst/crd/index_guidance.htm
Handbooks - continued

- Institute of Medicine - Finding What Works in Health Care: Standards for Systematic Reviews

- EUnetHTA WP4 - HTA Core Model for Medical and Surgical Interventions
  http://meka.thl.fi/htacore/model/HTA%20Core%20Model%20for%20Medical%20and%20Surgical%20Interventions%201.0r.pdf
Web resources

- HTAi Vortal
  http://www.htai.org/vortal/
- SuRe Info
  http://www.sure-info.org/
- Health Technology Assessment on the Net International
- Grey Matters: a practical search tool for evidence-based medicine
  http://www.cadth.ca/en/resources/finding-evidence-is/grey-matters
Search filter websites

The InterTASC Information Specialists' Sub-Group Search Filter Resource
http://www.york.ac.uk/inst/crd/interasc/index.htm

McMaster University, Health Information Research Unit (HIRU)
http://hiru.mcmaster.ca/hiru/HIRU_Hedges_home.aspx

(Based on Voutier 2011)
Training Opportunities

- HTAi IRG pre-conference workshops
- HTAi Vortal: Career Development – Training
  
  http://www.htai.org/vortal/?q=training

- Cochrane Collaboration
  
  http://www.cochrane.org/training

- York Health Economics Consortium
  
  http://www.yhec.co.uk/training/

- National Information Center on Health Services Research and Health Care Technology
  

(Based on Voutier 2011)
Acknowledgements

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References

- Glanville J. Advanced search techniques for systematic reviews, health technology assessment and guideline development [PPT presentation]. 2013 Oct 22; York, UK.
- Kaunelis D, Farrah K. Introduction to literature searching [PPT presentation]. Canadian Agency for Drugs and Technologies in Health; 2011.