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Identification of Diagnostic Test Accuracy studies

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(thanks to Anne Eisinga, UK Cochrane Centre, and to Jacqueline Limpens, Dutch Cochrane Centre)

Key Challenges

- Incomplete and inconsistent reporting by authors
- Incomplete and inconsistent indexing
- Efficiency of methodology search filters is hampered

Authors of diagnostic test accuracy reviews are likely to retrieve thousands of records to scan for potentially relevant studies for their review

Meeting the challenges

- Sources to search
- Search methods to use
 - Structure of search
 - Problematic terminology
 - Methodology search filters for DTA studies
- Screening records to decide relevance
- Documenting and reporting search methods and results

First thing to do!

Seek guidance from a local healthcare librarian or information specialist, where possible one with experience in:

- conducting searches for systematic reviews
- conducting searches for diagnostic questions

Or, if you are doing a Cochrane Diagnostic Test Accuracy Review, contact the Trial Search Coordinator of the Group that you are working with.

Sources to search

- A range of biomedical databases to avoid missing relevant studies (Whiting 2008a)
 - examined 8 systematic reviews and their database searches
 - MEDLINE, EMBASE, BIOSIS, Science Citation Index, LILACS all uniquely contributed relevant studies
 - none of the searches in a specific database identified all studies included in a review
 - over 20% of the included studies were not found by searching MEDLINE
 - 6% of the included studies were not found by the electronic searches

Searching only in Medline is NOT sufficient!

Sources to search

Basic

- General biomedical databases (MEDLINE, EMBASE)
- 2. (Cochrane resources)
- 3. National/regional databases
- 4. Topic-specific databases

More extensive

- Reference checking
- "Grey Literature"
- 3. (Handsearching → CENTRAL, CRG Register)
- 4. Prospective Trial Registers
- 5. (Systematic) "Snowballing"

Most important

Sources to search

- Cochrane Register of Diagnostic Test Accuracy Studies
 - centralized, study-based
 - improve access to DTA studies
 - around 4000 studies
 - assist with lobbying for improved indexing e.g. Publication Type for DTA studies
 - not yet publicly available <u>www.cochrane.org/docs/DiagnosticTestRegisterPlan.doc</u>

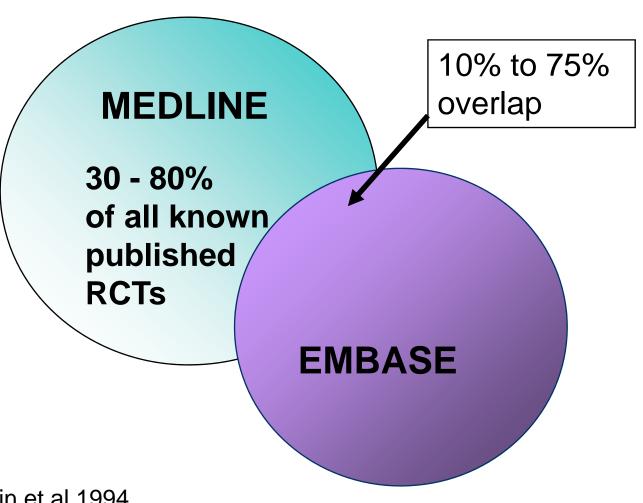
MEDLINE

- National Library of Medicine (NIH, USA)
- From 1966
 - OLDMEDLINE 1950-1966
- 5200 biomedical journals*
- >16 million records*
- Different search-interfaces (hosts)
 - PubMed (free) http://www.pubmed.gov
 - Ovid

EMBASE

- No free access (Elsevier)
- More emphasis on drugs, pharmacology and psychiatry
- o From 1974
- <4900 journals (more European titles)*</p>
- 12 million records*
- Different interfaces, i.e.:
 - OVID
 - EMBASE.com (+ MEDLINE)

Overlap MEDLINE & EMBASE



Dickersin et al 1994.

Specific databases

- LILACS. Citations to research originating in Latin America and the Caribbean
- Chinese Biomedical Literature Database
- HINARI (developing countries)
- CINAHL = Cumulative Index to Nursing and Allied Health
- PsycINFO, citations with abstracts to the scholarly literature in the psychological, social, behavioral, and health sciences
- AMED = Allied and Alternative Medicine
- PEDro: Physiotherapy Evidence Database

"Grey Literature"

- Only 50% of congress abstracts will eventually be published as full paper*
- More likely to contain 'negative results'*
- 10% of references in Cochrane Reviews

- Abstracts of conferences, reports
- SIGLE (opensigle.inist.fr)
- British Library Inside = database with a list of abstracts of conferences
- BIOSIS
- o ISI

(Systematic) "Snowballing"

Use included articles as a source to identify missing studies:

- Reference lists !! check cited articles = backward searching
- Web of Science, SCOPUS
 check citing articles = forward searching
- ("Related articles" / "Find Similar" in MEDLINE, EMBASE) → only to find new terms to expand your search

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Structure of Search

- Design a search strategy to reflect the key components of the review question
 - Index Test(s)
 - Target Condition
 - Reference Standard
 - Patient Description
- o <u>Search structure examples</u>:
 - Index Test(s) AND Target Condition
 - Index Test(s) AND Target Condition AND Patient Description
 - (Index Test(s) OR Reference Standard) AND Target Condition
 - (Index Test(s) OR Reference Standard) AND Target Condition AND Patient Description
- Routine use of methodological search filters for diagnostic test accuracy is not currently recommended (Doust 2005, Mitchell 2005, Leeflang 2006, Ritchie 2007, Whiting 2008b)

Structure of Search

"Clinical assessment for diagnosing congenital heart disease in newborn infants with Down Syndrome"

- Index test(s): physical examination, auscultation, palpation, pulse, observation, electrocardiography, chest radiograph
- Target condition: congenital heart disease
- Reference standard: echocardiography
- Patient description: newborn infants with Down Syndrome

Structure of search:

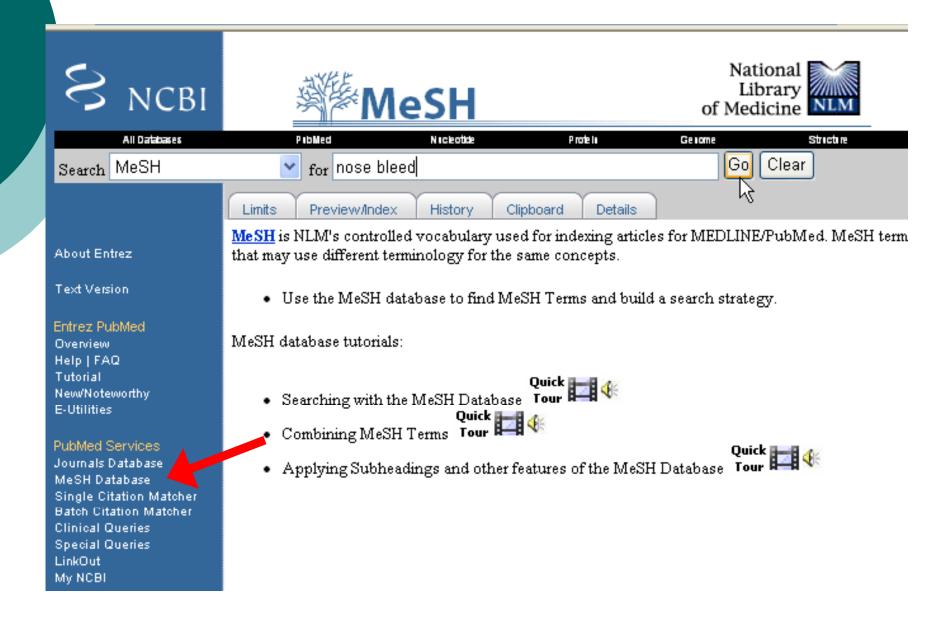
Index test(s) AND Target condition AND Patient description

(Index test(s) OR Reference standard) AND Target condition AND Patient description

Search methods to use

- Check related DTA systematic reviews, evidence-based guidelines etc for reported search strategies for useful terms (subject headings and text words)
- Search for known relevant studies in the database check to see how these are indexed and look for any useful text words in the titles and abstracts (where available) to cover each concept
- Check the search tools provided with the database (e.g. MeSH database option in PubMed; Permuted Index under Search Tools in Ovid)

Using the MeSH-database











> NCBI	of Medicine	NLM Sign In Register
All Databases	ProbMed Nickottide Proteli Gerome	Stricture OMIM PMC Joinals Books
Search MeSH	for nose bleed Go Clea	Save Search
	Limits Preview/Index History Clipboard Details	
About Entrez	Suggestions: Nose bleed; Nose bleed; Nosebleed; Nile blue; Nerve block; Nose disease; Night blue; Nevi, blue; Nose cancer; Nosporin b; more	
Text Version	Display Summary Show 20 V Send to	<u> </u>
Entrez PubMed	All: 4 🛠	
Overview Help FAQ	Items 1 - 4 of 4	One page.
Tutorial New/Noteworthy E-Utilities	1: Epistaxis Bleedix hyfrom the nose.	PubMed, PubMed - Major Topic, Clinical Queries, NLM MeSH Browser
PubMed Services Journals Database MeSH Database Single Citation Matcher Batch Citation Matcher	2: Naseptin [Substance Name] nasal cream containing above two cpds; used to treat patients with epistaxis Date introduced: October 8, 1991	PubMed, Clinical Queries, NLM MeSH Browser
Clinical Queries Special Queries LinkOut My NCBI	3: <u>Leishmaniasis, Mucocutaneous</u> A disease characterized by the chronic, progressive spread of lesions from N complex to the nasal, pharyngeal, and buccal mucosa some time after the app	
Related Resources Order Documents NLM Mobile	frequent presenting symptoms.	
NLM Catalog	4: Embolization, Therapeutic	PubMed, PubMed - Major Topic, Clinical Queries, NLM MeSH Browser

JNE and may not reflect current rules for allowable combinations.
drug therapy economics enzymology epidemiology y mortality nursing parasitology pathology radiotherapy rehabilitation surgery therapy
in the MeSH tree).

Search methods to use

- Aim for the search to be highly sensitive (likely to result in low precision)
 - Use a range of terms (text words and subject headings e.g. MeSH, EMTREE)
 - Advanced search techniques (e.g. 'explode' subject headings to retrieve more specific terms as well, use of floating subheadings)
 - Synonyms, related terms, variant spellings, acronyms, abbreviations
 - Truncation, wildcards

Search methods to use

- If search results are too many to deal with pragmatically seek advice from your Trials Search Co-ordinator on methods to test out to improve precision
 - Restricting to studies involving humans
 - Excluding irrelevant publication types such as case reports
 - Careful use of proximity operators, where available e.g. ((spleen or splenic) adj3 diamet\$)
 - Use of subheadings with specific subject headings rather than use floating subheadings
 - e.g. Chest/radiography rather than radiography.fs.

Target condition

- named disease (e.g. myasthenia gravis)
- disease stage (e.g. early stage breast cancer)
- any of a number of related conditions (e.g. urinary tract infections)

Target condition: myasthenia gravis

<u>Text words:</u> <u>MeSH terms:</u>

myasthen\$ OR MG OR ocular-myasthen\$ Myasthenia gravis/

OR generali?ed-myasthen\$

Target condition: urinary tract infections

Text words:

(infection\$ adj3 (urinary OR urine OR urethra OR bladder OR ureter\$ OR kidney OR kidneys OR renal)

etc...

MeSH terms:

exp Urinary Tract Infection/

(Bacterial infection/ OR

Gram negative infection/ OR

Enterobacter infection/ OR

Staphylococcus infection/ OR exp Leukocyte/ OR vesicoureteral reflux/ OR exp pyelonephritis/ OR Bacteriuria/ OR exp Cystitis/)

AND

exp Urinary tract/

Search methods to use

Index test(s): clinical assessment

Text words

physical examination auscultat* palpat* electrocardiogra* ECG chest radiograph* chest roentgenogram chest X-ray Low oxygen saturation Pulse oximet*

MeSH terms

Physical examination/ (explode)
Electrocardiography/
Chest/radiography
Oximetry/

'diagnostic' subheadings:

- diagnosis (di)
 - o pathology (pa)
 - o radiography (ra)
 - o radionuclide imaging (ri)
 - o ultrasonography (us)

Other potentially useful 'diagnostic' subheadings:

- diagnostic use (du)
- analysis (an)
 - o blood (bl)
 - o cerebrospinal fluid (cf)
 - o isolation and purification (ip)
 - o urine (ur)
- physiopathology (pp)
- cytology (cy)
- innervation (ir)

Example: Diagnostic imaging (Astin 2008)

Radionuclide Imaging/

non-specified

for general use only,

Disease or anatomical term/ri

preferred use

Tomography, Emission-Computed

Positron-Emission Tomography

Tomography, Emission-Computed, Single-Photon

some indexers may use

name of imaging

technique rather than

"disease/ri" format

exp Magnetic Resonance Imaging/

no 'diagnostic'

subheading that covers

this type of imaging

Examples:

Text words (ti,ab):

Tensilon

MeSH terms

Edrophonium/diagnostic use

Edrophonium/

Nerve conduction tests

Electromyography/

Electrodiagnosis/ AND Neural Conduction/ Hand/innervation OR Wrist/innervation

(urinalysis or urine analysis or urine sample\$ or urine specimen\$ or (urine adj3 collect\$) or urine bags or distick\$ or dipstick\$ or dip stick\$ or urine microscopy or reagent strip\$)... Urine/analysis Urinalysis/

Methodology search filter for DTA studies

- Routine use of methodological search filters for diagnostic test accuracy is not currently recommended (Doust 2005, Mitchell 2005, Leeflang 2006, Ritchie 2007, Whiting 2008b)
 - Can lead to the omission of a considerable number of relevant studies (even the most sensitive filters)
 - Precision tends to be low relevant records may be lost for no substantial reduction in the number needed to read (NNR)

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Screening results to decide relevance

- More than one author should screen results of searches (Doust 2006)
 - Two authors screened results of searches for two systematic reviews
 - Good agreement between them
 - For one review either review author working alone would have missed one relevant study
- Some studies may be missed due to inadequate reporting of diagnostic accuracy terms in titles and abstracts (Fraser 2006)
- Where very large numbers of records need to be screened, likely agreement between review authors may be reduced and the probability of missing relevant articles may be higher

Documenting and reporting search methods and results

- What was searched (which databases, conference proceedings; journals etc)
- When they were searched (date when you searched each database)
- How they were searched (search strategy used for each database in an appendix)
- Results of the search
 (proposal to use flow diagram: how many retrieved, how many excluded (with reasons), how many included)

Meeting the challenge

- Further uptake of the STARD guidelines (Bossuyt 2003) is needed to continue to improve completeness of reporting research methods in DTA studies by authors and journal editors
- Standardization terms for Index test(s) would aid search efficiency (Cochrane Register of Diagnostic Test Accuracy Studies)
- Introduction of a specific study design term for DTA studies (such as a DTA Publication Type in MEDLINE, for example) would greatly help in the development of efficient and effective DTA search filters