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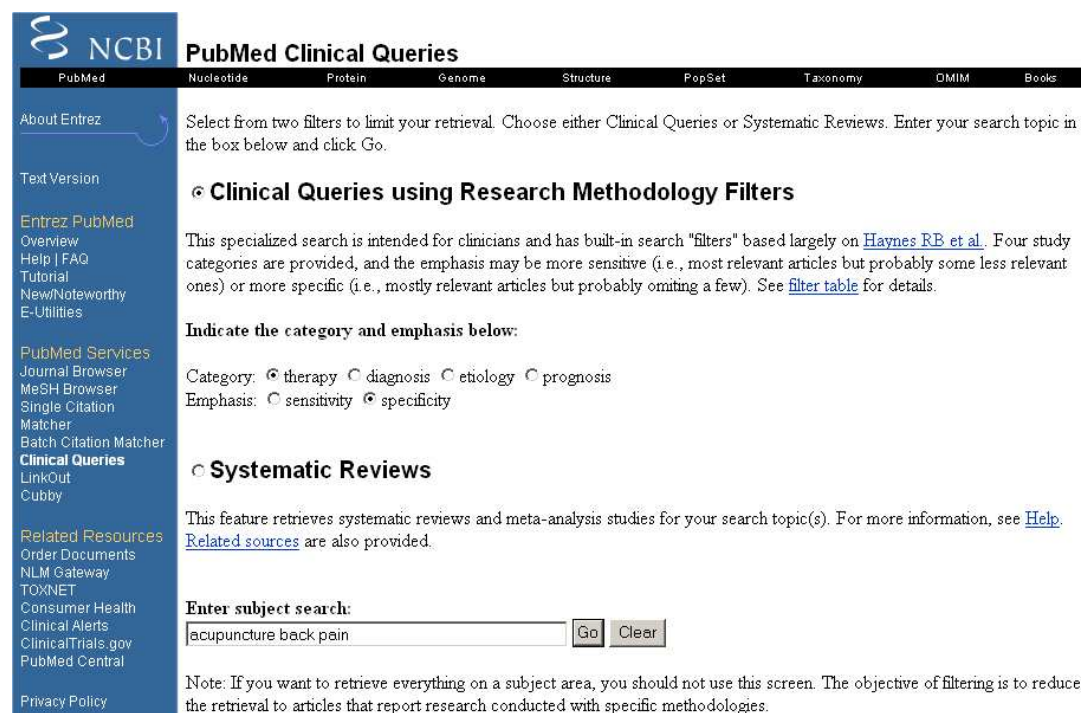Stefan-Meier-Str. 26, 79104 Freiburg

Efficient Medline search filters for clinical queries

Introduction:

Systematic reviews, such as those of the Cochrane Collaboration, are considered less biased than traditional reviews. However, in the creation of such reviews, the identification of all relevant articles becomes a crucial requirement. Considerable effort has been made by experienced searchers to achieve acceptable precision and recall rates, thereby reducing retrieval bias. Cochrane Review Groups, in particular, have contributed to sophisticated search strategies. Several tested and published strategies (i.e., in Clinical Evidence, www.clinicalevidence.com) are presented and compared to the corresponding PubMed "Clinical Queries" feature. The strategies include critical search terms to efficiently identify articles about therapy, diagnosis, etiology, prognosis, systematic reviews and clinical practice guidelines. In this summary, we demonstrate that the easy-to-use clinical query tools provided by PubMed (www.pubmed.gov) are, in many cases, not sufficient. The design of specific search strategies without using this feature is preferable, as it allows more flexibility. An example is demonstrated, showing the advantages and weakness of both methods.

Internal search strategies of "Clinical Queries" with PubMed:

Fig. 1: clinical queries screen

A quick approach to search for therapy, diagnosis, etiology, prognosis or systematic reviews is given by clicking the "Clinical Queries"-Link (Fig. 1):
 http://www.ncbi.nlm.nih.gov/entrez/query/static/clinical.html. Enter your keywords in the command line and choose the clinical category and focus on sensitivity (to find more relevant articles, but also some less relevant ones) or specificity (to find mainly relevant articles, but also miss a few). Your keywords and selected options are translated by PubMed into an internal strategy and can be viewed by clicking on "Details".
The internal search filters for clinical queries are based on a publication of Haynes RB et al. (7) and can be viewed by clicking on "filter table" on the Clinical Queries screen:
http://www.ncbi.nlm.nih.gov/entrez/query/static/clinicaltable.html (table 1).

Table 1: Table for Clinical Queries using Research Methodology Filters by Haynes et al. (7)

Category	Optimized for	Sensitivity/ Specificity	PubMed equivalent
Therapy	sensitivity	99%/74%	"randomized controlled trial" [PTYP] OR "drug therapy" [SH] OR "therapeutic use" [SH:NOEXP] OR "random*" [WORD]
	specificity	57%/97%	(double [WORD] AND blind* [WORD]) OR placebo [WORD]
Diagnosis	sensitivity	92%/73%	"sensitivity and specificity" [MESH] OR "sensitivity" [WORD] OR "diagnosis" [SH] OR "diagnostic use" [SH] OR "specificity" [WORD]
	specificity	55%/98%	"sensitivity and specificity" [MESH] OR ("predictive" [WORD] AND "value*" [WORD])
Etiology	sensitivity	82%/70%	"cohort studies" [MESH] OR "risk" [MESH] OR ("odds" [WORD] AND "ratio*" [WORD]) OR ("relative" [WORD] AND "risk" [WORD]) OR "case" control*" [WORD] OR case-control studies [MESH]
	specificity	40%/98%	"case-control studies" [MH:NOEXP] OR "cohort studies" [MH:NOEXP]
Prognosis	sensitivity	92%/73%	"incidence" [MESH] OR "mortality" [MESH] OR "follow-up studies" [MESH] OR "mortality" [SH] OR prognos* [WORD] OR predict* [WORD] OR course [WORD]
	specificity	49%/97%	prognosis [MH:NOEXP] OR "survival analysis" [MH:NOEXP]

When selecting "Systematic Reviews", and displaying the internal strategy by clicking on "Details", the search term for systematic reviews is merely identified as "systematic[sb]" (Fig.2) .
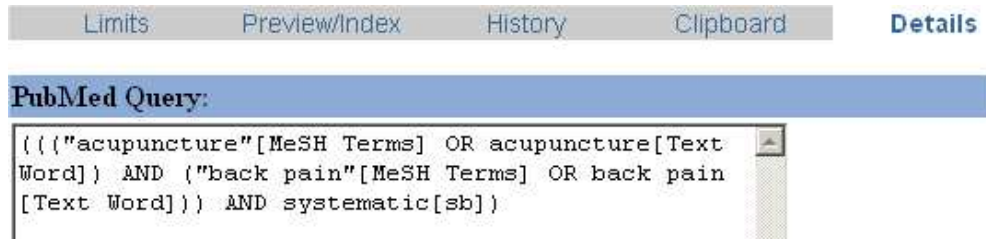

Fig. 2: Details of clinical queries search for systematic reviews of acupuncture therapy for back pain

The complete internal translation of the subset strategy "systematic[sb]" is available at
http://www.nlm.nih.gov/bsd/pubmed_subsets/sysreviews_strategy.html :

```
(("systematic review*" OR "systematic literature review*" OR
meta-analysis [pt] OR meta-analysis [ti] OR metaanalysis [ti]
OR meta-analyses [ti] OR evidence-based medicine OR
(evidence-based AND (guideline [tw] OR guidelines [tw]
OR recommendations)) OR (evidenced-based AND (guideline [tw]
OR guidelines [tw] OR recommendation*)) OR consensus
development conference [pt] OR
health planning guidelines OR guideline[pt]
OR
cochrane database syst rev OR
acp journal club OR
health technol assess OR
evid rep technol assess summ)
OR
((systematic [tw] OR systematically OR critical [tw] OR
(study [tiab] AND selection [tiab]) OR (predetermined OR
inclusion AND criteri* [tw]) OR exclusion criteri* OR
"main outcome measures" OR "standard of care")
AND
(survey [tw] OR surveys [tw] OR overview* OR review [tw]
OR reviews OR search* OR handsearch OR analysis [tw]
OR critique [tw] OR appraisal OR (reduction AND risk
AND (death OR recurrence)))
AND
(literature [tw] OR articles OR publications [tw] OR
 publication [tw] OR bibliography [tw] OR bibliographies
OR published OR unpublished OR citation OR citations OR
database OR internet [tw] OR textbooks [tw] OR references
OR trials OR meta-analysis [mh] OR (clinical [tw] AND studies)
OR treatment outcome))
NOT
(case report [ti] OR case report [mh] OR review of reported cases [pt]
 OR editorial [ti] OR editorial [pt] OR letter [pt] OR
clinical trial [pt] OR newspaper article [pt]))
```

Abbreviations:

[MeSH] or [MH]: Medical Subject Heading (automatically exploded with PubMed search: includes narrower terms)

[MH:NOEXP]: Medical Subject Heading without exploding (only broad term without narrower terms)

[SH]: Subheading (includes families of subheadings:
http://www.ncbi.nlm.nih.gov/entrez/query/static/help/pmhelp.html#FamiliesofSubheadingExplosions)

[SH:NOEXP]: Subheading without the other subheadings of the subheading family

[PTYP] or [PT]: Publication type

[TI]: Title

[WORD] or [TW]: Words and numbers in title, abstract, MeSH terms, MeSH Subheadings, chemical substance names, personal name as subject, and MEDLINE Secondary Source (SI) field.
The special fields can also be searched directly using the search field tags [pt], [ti], [tiab] etc. (see PubMed help Link: *http://www.ncbi.nlm.nih.gov/entrez/query/static/help/pmhelp.html*
Search Field Descriptions and Tags)

* : Truncation (variable endings): Note: The truncation sign in PubMed is ignored between quotes! Only the first 150 ending variations will be included. If you receive a warning message, use all possible words explicitly and combine with OR or lengthen the root word.

The Clinical-Queries-function is a quick and easy approach to provide some useful articles for answering clinical questions. Important search terms for methodologic criteria in studies of therapeutic interventions, diagnostic procedures, etiology, and prognosis are included in these internal strategies. This procedure however may not be sufficient for some questions. In many cases a more comprehensive approach is needed. To achieve appropriate precision and recall rates for your individual purpose, more flexibility is obtained by explicitly using Medline tools and combining your single search steps, i.e.:
1. MeSH browser (*http://www.ncbi.nlm.nih.gov/entrez/meshbrowser.cgi*):
   - to view the MeSH tree of a specific MeSH term and to select broader, narrower (explode function) or related terms
   - to see more information on this MeSH term and, if necessary, to choose appropriate subheadings by clicking on "detailed display"
2. Comprehensive textword search (in title, abstract, possibly with truncation). Unfortunately there is no "same sentence" or "near" function offered by PubMed.
3. Specific search fields i.e. publication type, limit function, i.e. age groups, publication year, language, subsets.

Detailed PubMed tutorials are available on the PubMed website *www.pubmed*.gov (help, tutorial). See also: further links on search instructions:
www.ub.uni-freiburg.de/virlib/med/recherchehilfe.html

Useful one-line strategies for storing in PubMed and later retrieval have been developed by Shojania et al. (10) and Robinson et al. (9). With the cubby link on the left side of the PubMed main screen your one-line strategies can be stored and restarted at any time
(see *http://www.ncbi.nlm.nih.gov/entrez/query/static/help/pmhelp.html#Cubby).*

Example: Acupuncture for treatment of back pain

Search with Clinical Queries function:

Category : therapy
Enter subject search : acupuncture back pain

1. Emphasis : specificity: Result: 28 hits

Internal strategy of PubMed:

Translations:	
acupuncture[All Fields]	("acupuncture"[MeSH Terms] OR acupuncture[Text Word])
back pain[All Fields]	("back pain"[MeSH Terms] OR back pain[Text Word])
User Query:	

(acupuncture back pain) AND ((double [WORD] AND blind* [WORD]) OR placebo [WORD])

2. Emphasis : sensitivity: Result: 61 hits

Internal strategy of PubMed:

Translations:	
acupuncture[All Fields]	("acupuncture"[MeSH Terms] OR acupuncture[Text Word])
back pain[All Fields]	("back pain"[MeSH Terms] OR back pain[Text Word])
drug therapy[SH]	"drug therapy"[Subheading]
therapeutic use[SH:noexp]	"therapeutic use"[Subheading:noexp]
User Query:	

(acupuncture back pain) AND (randomized controlled trial [PTYP] OR drug therapy [SH] OR therapeutic use [SH:NOEXP] OR random* [WORD])

A more comprehensive approach (view search strategy by clicking "history" link):

Search	Most recent query	result
#21 Search **#19 OR #16** (*found with MeSH terms in #1, #2, #3 or textwords in #17 and #18)* ***Final result of the more comprehensive strategy***		49
#20 Search **#19 NOT #16** (*not found with MeSH terms in #1, #2, #3)*		12
#19 Search **#15 AND #17 AND #18**		42
#18 Search **acupunctur*[tiab]**		5769
#17 Search **backache*[tiab] OR (back[tiab] AND (pain[tiab] OR pains[tiab] OR painful*[tiab] OR painless[tiab]))**		13768
Additional textwords in search #17 and #18 (for search in Premedline and citations not indexed with MeSH terms in #1, #2, #3)		
#16 Search **#5 AND #15**		37
#15 Search **#6 OR #7 OR #8 OR #9 OR #10 OR #12 OR #13**		356088
#14 Search **placebo*[tiab]**		73750
#13 Search **random*[tiab]**		246091
#12 Search **(singl*[tiab] OR doubl*[tiab]) AND (mask*[tiab] OR blind*[tiab])**		71167
#11 Search **placebos[mh]**		21319
#10 Search **double-blind method[mh]**		68674
#9 Search **single-blind method[mh]**		6516
#8 Search **random allocation[mh]**		45019
#7 Search **randomized controlled trials[mh]**		23358
#6 Search **randomized controlled trial[pt]**		160337
(Search #6 to #15 includes methodologic search terms for randomized controlled trials. In this example "placebo" is not included in search #15)		
#5 Search **#1 AND #4**		165
#4 Search **#2 OR #3**		7668
#3 Search **acupuncture therapy[mh]**		7613
#2 Search **acupuncture[mh]** (*MeSH term exists since 2002)*		67
#1 Search **Back Pain/therapy[MESH]**		6239

Comparison with Clinical Queries search :

#27 Search **#23 NOT #21** *additional results with Clinical queries search,* 16
 emphasis sensitivity, not found with comprehensive strategy

#26 Search **#22 NOT #21** *additional results with Clinical queries search,* 3
 emphasis specificity, not found with comprehensive strategy

#25 Search **#21 NOT #23** *additional results with comprehensive strategy, not* 4
 found with Clinical queries search, emphasis sensitivity

#24 Search **#21 NOT #22** *additional results with comprehensive strategy, not* 24
 found with Clinical queries search, emphasis specificity

#23 Search **(back pain acupuncture) AND (randomized controlled trial** 61
 [PTYP] OR drug therapy [SH] OR therapeutic use [SH:NOEXP] OR
 random* [WORD])

 Clinical queries search, emphasis sensitivity

#22 Search **(back pain acupuncture) AND ((double [WORD] AND blind*** 28
 [WORD]) OR placebo [WORD])

 Clinical queries search, emphasis specificity

Titles of search **#21 NOT #23:** *additional results with comprehensive strategy, not found with Clinical queries search, emphasis sensitivity*

```
1:  Acupuncture: an evidence-based review of the clinical literature.
2:  Acupuncture treatment of chronic back pain. A double-blind placebo-
    controlled trial.
3:  Acupuncture analgesia for chronic low back pain.
4:  Acupuncture for chronic back pain: patients and methods.
```


Titles of search **#23 NOT #21:** *additional results with Clinical queries search, emphasis sensitivity, not found with comprehensive strategy*

```
1:  Low back pain.
2:  Pain management in polycystic kidney disease.
3:  Septic arthritis of a lumbar facet joint due to pyonex.
4:  [Acupuncture and other forms of treatment for patients with chronic
    back pain]
5:  Failed back surgery syndrome.
6:  Bacterial meningitis and lumbar epidural hematoma due to lumbar
    acupunctures: a case report.
7:  Physical therapy: a critique.
8:  Role of physical therapy in the management of common low back pain.
9:  Acupuncture analgesia.
10: Studies on the enhanced effect of acupuncture analgesia and cupuncture
    anesthesia by D-phenylalanine (2nd report)--schedule of administration
    and clinical effects in low back pain and tooth extraction.
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11: Treatment of chronic back pain in horses. Stimulation of acupuncture
    points with a low powered infrared laser.
12: [A case of Staphylococcus aureus septicemia after acupuncture therapy]
13: A pain clinic in a small regional hospital--yes or no?
14: [Use of laser energy in the treatment of low-back pain syndrome]
15: [Acupuncture, Electropuncture and lasers in the treatment of low back
    pain]
16: Sedation of active acupuncture loci in the management of low back pain.
```

Discussion:

In this example the 4 additional hits retrieved with the comprehensive strategy, in comparison to the sensitive clinical queries search, are probably relevant to the question. In contrast, the 16 additional results of the sensitive clinical queries search seem to be less relevant. Some search terms regarding "randomization" are omitted. The clinical queries function may be useful for a quick approach, but it allows no flexibility with regard to precision and recall. By viewing the complete citation of a relevant article, some ideas of appropriate search terms for a more comprehensive query can be given.

Comprehensive search strategies for systematic reviews, meta-analyses, therapy (randomized controlled trials, controlled clinical trials), diagnosis, etiology, prognosis and guidelines have been published on several web sites and in journal articles or books (i.e. strategies developed by experts of the Cochrane Collaboration). These strategies can be modified according to specific situations and individual needs.

References for Medline strategies in Evidence-Based Medicine:

1. Clinical Evidence (www.clinicalevidence.com):
    http://www.clinicalevidence.com/lpBinCE/lpext.dll/ABOUTCE/search.html
2. ADEPT: Applying Diagnosis, (a)Etiology, Prognosis & Therapy methodological filters to retrieving the evidence
    http://www.shef.ac.uk/~scharr/ir/adept/index.htm
3. Search Strategies to Identify Systematic Reviews and Meta-analyses
    http://www.york.ac.uk/inst/crd/search.htm
4. Methodological filters
    http://www.londonlinks.ac.uk/evidence_strategies/index.htm
5. Related sources for searching for systematic reviews:
    http://www.nlm.nih.gov/bsd/pubmed_subsets/sysreviews_sources.html
6. Guyatt G, Rennie D (Eds.): User's Guide to the Medical Literature. Book from JAMA-Series, incl. CD-ROM. (Book Review: *http://www.cochrane.de/deutsch/pnews9.htm#buec*) American Medical Association (AMA Press) 2001
    - A Manual for evidence-based Clinical Practice. (ISBN 1-57947-174-9)
    - Essentials for Evidence-based Clinical Practice. (ISBN 1-57947-191-9)
7. Haynes RB, Wilczynski N, McKibbon KA, Walker CJ, Sinclair JC: Developing optimal search strategies for detecting clinically sound studies in MEDLINE. J Am Med Inform Assoc 1994 Nov-Dec;1(6):447-58
8. McKibbon A, Marks E: PDQ Evidence-Based Principles and Practice. B.C. Decker, London 1999 (incl. CD-ROM).
    (Book Review: *http://www.cochrane.de/deutsch/pnews6d.htm#books*)

9. Robinson KA, Dickersin K: Development of a highly sensitive search strategy for the retrieval of reports of controlled trials using PubMed. Int. J. Epidemiol. Vol. 31, 2002: 150-153

10. Shojania KG, Bero LA: Taking advantage of the explosion of systematic reviews: an efficient MEDLINE search strategy. Eff Clin Pract 2001 Jul-Aug; 4(4):157-62
http://www.acponline.org/journals/ecp/julaug01/shojania.htm

11. Shojania KG, Olmsted RN: Searching the health care literature efficiently: from clinical decision-making to continuing education. Am J Infect Control. 2002 May;30(3):187-95.