Evidence Based Medicine: HPCMLA

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Objectives

- Principles of evidence-based medicine
- Formulating the well-built clinical question
- Finding the evidence
- Searching for the evidence
- Appraising the evidence
Principles of EBM

- Definition
- Importance of incorporating evidence-based medicine into clinical practice
- Components of evidence-based medicine decisions
- Steps of evidence-based medicine

Definition

“...the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient. It means integrating individual clinical expertise with the best available external clinical evidence from systematic research.”

Sackett DL; Rosenberg WM; Gray JA; Haynes RB; Richardson WS. Evidence based medicine: what it is and what it isn't. BMJ. 1996 Feb;312(7023):71-2.
Why Evidence-Based Medicine?

- Informed decision making
- Information explosion
- Validity

Components of EBM Decisions

- Clinical Expertise
- Patient’s Values
- Research Evidence
Steps of EBM

1. Recognizing the need for information
2. Formulating the question
3. Searching for the evidence
4. Appraising the evidence
5. Applying the evidence to the patient
6. Evaluating your performance

Formulating the Question

- Define the patient problem
- Refine this need by developing a focused clinical question which can be answered
- Use the question to direct a targeted search for evidence-based answers
General Questions

- Background questions
- Ask for general knowledge about a disorder
- Components
  - Question root (who, what where, when, why, how) with a verb
  - A disorder, or an aspect of a disorder
- Books (print or online)


Specific Questions

- Foreground questions
- Ask for specific knowledge about a managing a patient with a disorder
- Components
  - P - Patient and/or Problem
  - I - Intervention
  - C - Comparison
  - O - Outcome

Types of Clinical Questions

- Diagnosis
- Prognosis
- Therapy
- Etiology
- Economics

Sample Case #1

You see an adult male patient who is suffering from a heart attack. You remember reading somewhere about using PTCA (percutaneous transluminal coronary angioplasty), rather than thrombolytic therapy, to treat MI (myocardial infarction) patients.

Adapted from Pimental S. Turning research into practice. 7/25/2001
Sample Case #1 in PICO

- Patient/Problem: Myocardial infarction
- Intervention: PTCA (percutaneous transluminal coronary angioplasty)
- Comparison: Thrombolytic drugs
- Outcome: Effectiveness of therapy
  - Mortality rates
  - Occurrence of side effects

Adapted from Pimental S. Turning research into practice. 7/25/2001

Sample Case #2

You are working in a neonatal ICU. You are about to take blood from a baby born at 34 weeks gestation who is now 24 hours old and not been ventilated. The nurse suggests you give the baby some oral sucrose before the procedure as analgesia. You have never used sucrose before and are uncertain whether there is any real evidence behind its efficacy.

Sample Case #2 in PICO

- Patient/Problem: Pain, Infant
- Intervention: Sucrose
- Comparison: none
- Outcome: Effectiveness of therapy to ease pain


Searching for the Evidence

- Where is the evidence?
  - Evidence pyramid
  - Grading the evidence
- EBM resources
- Database searching
Evidence Pyramid

Randomized Controlled Studies

Cohort Studies

Case Control Studies

Case Series

Case Reports

Ideas, Editorials, Opinions

Animal research

In vitro ('test tube') research

Meta-analysis

Grading the Evidence

- **I**: Evidence obtained from at least one properly randomized controlled trial.
- **II-1**: Evidence obtained from well-designed controlled trials without randomization.
- **II-2**: Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one center or research group.
- **II-3**: Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of the introduction of penicillin treatment in the 1940s) could also be regarded as this type of evidence.
- **III**: Opinions of respected authorities, based on clinical experience descriptive studies and case reports or reports of expert committees.

EBM Resources

- Pre-appraised evidence
  - Practice guidelines
  - Reviews
    - Narrative
    - Systematic
- Articles


Practice Guidelines

- Systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances*
- National Guidelines Clearinghouse (web)
- Health care standards : official directory.
  - HML call no.: W 22 AA1 H42
- Journal databases
  - CINAHL
  - Medline / PubMed
  - Search using publication type and subject heading

National Guidelines Clearinghouse

- Publisher: Agency for Healthcare Research and Quality (AHRQ), et al.
- Sources
  - Federal agencies
  - Professional organizations
- Browse
- Search
- URL: http://www.guideline.gov/
Test Drive: NGC

- Patient/Problem: Pain, Infant
- Intervention: Sucrose
- Comparison: none
- Outcome: Effectiveness of therapy to ease pain

Reviews: Narrative

- Good for background and overview information
- May include evidence
- Lack explicit methodological quality criteria for inclusion
- Resources
  - eMedicine
  - UpToDate
eMedicine

- Clinical Knowledge Base: +7000 topics
- Updated daily
- Free and subscription
- URL: http://www.emedicine.com/

UpToDate

- Topic reviews
  - Nearly 3000 authors
  - Peer reviewed
- Able to separate pediatric-related topic reviews
- Updated quarterly
- Updated once a year (each topic)
- Subscription
- URL: http://www.uptodate.com
Reviews: Systematic

- Databases
  - Centre for Reviews and Dissemination
  - Cochrane Library
  - TRIP
- Journals
  - ACP Journal Club
  - Bandolier
  - Clinical Evidence
  - Other journals

Centre for Reviews and Dissemination

- Based at the University of York (UK)
- Databases
  - Database of Reviews of Effects (DARE)
  - NHS Economic Evaluation Database (NHS EED)
  - Health Technology Assessment Database (HTA)
- Free
- URL: http://www.york.ac.uk/inst/crd/
Database of Abstracts of Reviews of Effects

- Contains reviews of systematic reviews
- Source of reviews
  - Major medical journals
  - Regular database searches
  - Gray literature
- Updated monthly
- URL:
  [http://www.york.ac.uk/inst/crd/darehp.htm](http://www.york.ac.uk/inst/crd/darehp.htm)

Test Drive: DARE

- Patient/Problem: Pain, Infant
- Intervention: Sucrose
- Comparison: none
- Outcome: Effectiveness of therapy to ease pain
Search results

Select sets of items by clicking in the boxes
or click on the title to see an individual record

Database of Abstracts of Reviews of Effects (DARE)
angioplasty All fields AND Thrombolysis All fields - 15 Hits (1-12)

□ (Record 1)
Comparison of primary coronary angioplasty and intravenous thrombolytic therapy for acute myocardial infarction.

□ (Record 2)
Does PTCA in acute myocardial infarction affect mortality and reinfarction rates: a quantitative overview meta-analysis of the randomized clinical trials.

□ (Record 3)
Percutaneous transluminal coronary angioplasty versus thrombolysis in acute myocardial infarction: a meta-analysis.

Cochrane Library

- Cochrane Collaboration
- Contents:
  - Cochrane Controlled Trials Register
  - Cochrane Database of Methodology Reviews
  - Cochrane Database of Systematic Reviews
  - Cochrane Methodology Register
  - Database of Reviews of Effects
  - Health Technology Assessment Database
  - NHS Economic Evaluation Database
- Subscription
- URL: http://www.cochrane.org
Cochrane Controlled Trials Register

- Bibliographic database of published reports of definitive controlled trials
  - Clinical control trials
  - Randomized control trials
- Updated quarterly
- Citations (+300,000)*
  - Embase
  - Medline
  - Other sources

*As of 4th Qtr 2003.

Cochrane Database of Systematic Reviews: Content

- Meta-analyses of studies meeting strict quality criteria
- Structured reviews
  - http://www.cochrane.org/reviews/revstruc.htm
- Contents cumulative
- Updated quarterly
- Free abstracts
  - http://www.cochrane.org/reviews/index.htm
  - PubMed
- Complete reviews
  - Subscription required
  - Ovid: Contains complete reviews and protocols
Test Drive: CDSR

- Patient/Problem: Pain, Infant
- Intervention: Sucrose
- Comparison: none
- Outcome: Effectiveness of therapy to ease pain
EBM Reviews @ Ovid

- ACP Journal Club
- Cochrane Controlled Trials Register
- Cochrane Database of Systematic Reviews
- Database of Abstracts of Reviews of Effectiveness (DARE)
- Available to HML members

TRIP Database

- Turning Research into Practice
- Searches over 70 databases of hyperlinks from “evidence-based” sites around the world
  - Evidence based, guidelines, general peer-reviewed journals, query-answering services, specialist peer-reviewed journals, e-textbooks, medical images, patient information leaflets, PubMed’s Clinical Queries
- Basic version: Free
- Enhanced version (TRIP Plus): Subscription
- Updated monthly
- URL: http://www.tripdatabase.com
ACP Journal Club

- Publisher: American College of Physicians
- Reviews studies considered methodologically sound and clinically relevant
- Publishes enhanced abstracts summarizing findings and commenting on clinical implications
- Published bi-monthly
- Print and electronic
- Subscription

URL: http://www.acpjc.org/
Bandolier

- Publisher: Pain Relief Unit, University of Oxford
- Reviews systematic reviews, meta-analyses, randomized trials, and high quality observational studies
- Published monthly
- Free and subscription
- Print and electronic
- URL: http://www.jr2.ox.ac.uk/bandolier/index.html

Clinical Evidence

- Publisher: BMJ Publishing Group
- Collection of summaries of evidence
- Addresses mostly therapy questions
- Published semi-annually
- Print and electronic
- Subscription
- URL: http://www.clinicalevidence.com
Other Journals

- Evidence-Based Cardiovascular Medicine
- Evidence-Based Dentistry
- Evidence-Based Healthcare
  - Continues: Evidence-Based Health Policy & Management
- Evidence-Based Medicine (EBM Online)
- Evidence-Based Obstetrics & Gynecology
- Evidence-Based Oncology
  - Continued by: Cancer Treatment Reviews

Articles: Develop a Search Strategy

- Formulate the question
- Select the appropriate database
  - CINAHL
  - MEDLINE
CINAHL

- Cumulated Index of Nursing and Allied Health Literature
- Evidence-based medicine content
  - Specific interest category: Evidence-Based Practice
  - Publication types: Care plan, Clinical innovations, Critical path, Practice guidelines, Protocol, Research, Standards, Systematic review
- Subscription

Medline

- National Library of Medicine
- Premiere biomedical journal database
- 1966-Present
- +4,600 journals
- +12 million citations
- Free and subscription
- PubMed
Articles: Develop a Search Strategy

- Identify search terms
  - Subject headings (MeSH)
  - Text words
- Combine search terms (AND, OR, NOT)
- Refine the search
  - Major MeSH / Focus
  - Exploding
  - Subheadings
  - Limits: Language, age group, human
  - Filters

Filters for Evidence

- Filter components
  - Subject headings (MeSH)
  - Publication types
  - Subheadings
  - Text words
- Specific for each type of clinical question
Filters for Evidence: Diagnosis

- Subject headings
  - Double blind method; False negative reactions; False positive reactions; Predictive value of tests; Prospective Studies; Random allocation; Sensitivity and specificity (explode); Single blind method

- Publication types
  - Consensus development conferences; Controlled clinical trial; Practice guideline; Randomized controlled trial


Filters for Evidence: Etiology

- Subject headings
  - Case control studies (explode); Cohort studies (explode); Epidemiologic studies (explode); Odds ratio; Prospective studies; Risk (explode)

- Publication types
  - Controlled clinical trial; Practice guideline; Randomized controlled trial

Filters for Evidence: Prognosis

- Subheadings
  - Mortality
- Subject headings
  - Cohort studies (explode); Disease progression; Follow-up studies; Morbidity (explode); Mortality (explode); Outcome assessment (Health Care) (explode); Prognosis; Survival analysis (explode)

Nesbit K. Evidence based filters for Ovid Medline.
http://www.urmc.rochester.edu/hslt/miner/digital_library/tip_sheets/OVID EB Filters.pdf

Filters for Evidence: Therapy

- Subject headings
  - Clinical protocols; Clinical trials (explode); Comparative study; Double blind method; Epidemiologic research design (explode); Feasibility studies; Meta-analysis; Placebos; Research design (explode); Treatment outcomes (explode)
- Publication types
  - Clinical trial; Controlled clinical trial; Meta-analysis; Multicenter study; Practice guideline; Randomized controlled trial

Nesbit K. Evidence based filters for Ovid Medline.
http://www.urmc.rochester.edu/hslt/miner/digital_library/tip_sheets/OVID EB Filters.pdf
Filters for Evidence: Web Sites

Edward G. Miner Library, Univ. of Rochester Medical Center

Norris Medical Library, USC
- Evidence Based Medicine Search Filters - http://www.usc.edu/hsc/nml/lis/tutorials/ebmfilters.html
- Searching for the Best Evidence in Clinical Journals - http://www.cebm.net/searching.asp

Filters for Evidence: Additional Resources


CINAHL: Filters

- Katy Nesbit, Edward G. Miner Library, University of Rochester Medical Center
- HML
  - http://hml.org/WWW/filtrcin.html
  - Ovid Expert Searches
    - Requires personal account
- Reviews and Meta-Analyses - Centre for Reviews and Dissemination
  - http://www.york.ac.uk/inst/crd/search.htm

Medline: Filters

- Katy Nesbit, Edward G. Miner Library, University of Rochester Medical Center
- HML
  - http://hml.org/WWW/filtrmed.html
  - Ovid Expert Searches
    - Requires personal account
PubMed

- Publisher: NLM/NCBI
- Content
  - Medline
  - Oldmedline
  - In process citations
  - Publisher-supplied citations
- Built in filters
  - Clinical queries
  - Systematic reviews
- URL: http://www.pubmed.gov

PubMed: Clinical Queries

- Category
  - Therapy
  - Diagnosis
  - Etiology
  - Prognosis
- Emphasis
  - Sensitivity: Comprehensive retrieval is desired. Relevance of retrieval is less precise.
  - Specificity: Relevancy of retrieval is more precise.
### PubMed Clinical Queries

Select from two filters to limit your retrieval. Choose either Clinical Queries or Systematic Reviews. Enter your search topic in the box below and click Go.

#### Clinical Queries using Research Methodology Filters

This specialized search is intended for clinicians and has built-in search "filters" based largely on **H紧张** et al. Few study categories are provided, and the emphasis may be more sensitive (i.e., most relevant articles but probably some less relevant ones) or more specific (i.e., mostly relevant articles but probably omitting a few). See the [filter details](#) for more information.

### Indicate the category and emphasis below:

**Category**
- ◯ therapy  ◯ diagnosis  ◯ etiology  ◯ prognosis

**Emphasis**
- ◯ sensitivity  ◯ specificity

#### Systematic Reviews

This feature retrieves systematic reviews and meta-analysis studies for your search topic(s). For more information, see [help](#). Related resources are also provided.

Enter subject search: [Go] [Clear]
### Table for Clinical Queries using Research Methodology Filters

<table>
<thead>
<tr>
<th>Category</th>
<th>Optimized for</th>
<th>Sensitivity/Specificity</th>
<th>PubMed equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapy</td>
<td>sensitivity</td>
<td>50%±7%</td>
<td>&quot;randomized controlled trial&quot; [PTYP] OR &quot;drug therapy&quot; [SH] OR &quot;therapeutic use&quot; [MESH] OR &quot;random&quot; [WORLD]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnoses</th>
<th>specificity</th>
<th>57%±9%</th>
<th>&quot;double [WORLD] AND blind [WORLD] OR placebo [WORLD]</th>
</tr>
</thead>
<tbody>
<tr>
<td>specificity</td>
<td>specificity</td>
<td>92%±7%</td>
<td>&quot;sensitivity and specificity&quot; [MESH] OR &quot;sensitivity&quot; [SH] OR &quot;diagnostic&quot; [SH] OR &quot;specificity&quot; [WORLD]</td>
</tr>
<tr>
<td>Etiology</td>
<td>specificity</td>
<td>55%±9%</td>
<td>&quot;sensitivity and specificity&quot; [MESH] OR &quot;predictive&quot; [WORLD] OR &quot;value&quot; [WORLD]</td>
</tr>
<tr>
<td>specificity</td>
<td>specificity</td>
<td>40%±9%</td>
<td>&quot;case-control studies&quot; [MESH] OR &quot;cohort studies&quot; [MESH]</td>
</tr>
<tr>
<td>specificity</td>
<td>specificity</td>
<td>40%±9%</td>
<td>&quot;prognosis&quot; [MESH] OR &quot;survival analysis&quot; [MESH]</td>
</tr>
</tbody>
</table>

1. Sensitivity and specificity as reported in Harmon EB et al.
2. Approximate equivalent in the PubMed query language as recommended in Harmon EB et al., for searches from 1991 to the present. The PubMed Clinical Queries Using Research Methodology Filters page uses these parameters for all searches, regardless of time period, in the interest of simplicity.

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**Clinical Queries using Research Methodology Filters**

This specialized search is intended for clinicians and has built-in search filters based largely on Harmon EB et al. Four study categories are provided, and the emphasis may be more sensitive (i.e., most relevant articles but probably some less relevant ones) or more specific (i.e., mostly relevant articles but probably omitting a few). See the filter table for details.

- Indicate the category and emphasis below:
  - **Category:** therapy OR diagnosis OR etiology OR prognosis
  - **Emphasis:** specificity OR sensitivity

#### Systematic Reviews

This feature retrieves systematic reviews and meta-analysis studies for your search topic(s). For more information, see Help. Related resources are also provided.

Enter subject search:

```
myocardial infarction angioplast* thrombol*
```

Note: If you want to retrieve everything on a subject area, you should not use this screen. The objective of filtering is to reduce the retrieval to articles that report research conducted with specific methodologies.
### Test Drive: PubMed Clinical Queries

**Patient/Problem:** Pain, Infant  
**Intervention:** Sucrose  
**Comparison:** none  
**Outcome:** Effectiveness of therapy to ease pain

<table>
<thead>
<tr>
<th>ID</th>
<th>Title</th>
<th>Authors</th>
<th>Journal</th>
<th>PubMed ID</th>
<th>Related Articles</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Effect of pericentral, an anti-C5 complement antibody, as an adjunctive therapy to fistulization in acute myocardial infection: the COMPLiment inhibition in myocardial infection treated with thrombolysis (COMPLIFY) trial</td>
<td>Malekhy HP, O'Connor CR, Muscal C, Smith J, Wexner SD, Thomas P, Lindsey R, Moonesoo P</td>
<td>J Am Heart Assoc 2013 Sep 9;10(10):1176-83. Epub 2013 Aug 18</td>
<td>21925453</td>
<td>Related Articles</td>
<td>Link</td>
</tr>
<tr>
<td>2</td>
<td>Blockade of the platelet P2Y12 receptor by AR-C99940, a novel coronary artery recanalization and improves the myocardial reperfusion as a cause thrombosis model.</td>
<td>Arterioscler Thromb Vasc Biol 2003 Feb 1;23(2):357-62.</td>
<td></td>
<td>12667904</td>
<td>Related Articles</td>
<td>Link</td>
</tr>
<tr>
<td>4</td>
<td>Use of low-molecular-weight heparins in the management of acute coronary artery syndromes and</td>
<td></td>
<td></td>
<td>12678543</td>
<td>Related Articles</td>
<td>Link</td>
</tr>
</tbody>
</table>
PubMed: Systematic Reviews

- Systematic reviews
- Meta-analysis
- "Retrieves citations identified as systematic reviews, meta-analyses, reviews of clinical trials, evidence-based medicine, consensus development conferences, guidelines, and citations to articles from journals specializing in review studies of value to clinicians."*

Clinical Queries
You may select from two filters to limit your retrieval. Choose either Clinical Queries or Systematic Reviews.

Clinical Queries using Research Methodology Filters
This specialized search query with built-in research methodology filters is intended for clinicians. Four study categories or filters are provided: therapy, diagnostic, etiology, and prognosis. Two emphasis categories or filters are provided: sensitivity or specificity (more precise articles are retrieved, but probably some less relevant). See the filter for details.

Systematic Reviews
This feature is provided to help health professionals locate systematic review and similar articles. It combines your search term(s) with citations identified as systematic reviews, meta-analyses, reviews of clinical trials, evidence-based medicine, consensus development conferences, and guidelines. Citations from journals specializing in clinical review studies are also included. The resulting retrieval can be further refined using PubMed's Limits e.g., English language. (Please note: outside of the Clinical Queries screen, this subset can be combined directly with other search topics.) For example: tissue disease AND systematic [sb]. Systematic Reviews uses a customized search strategy: a list of related sources on this topic is provided.

For More Assistance
Customer Support
If you need more assistance, please call the NLM Customer Service Desk at 1-888-346-3508. You may also contact the NLM Customer service desk at 1-888-346-3508. Hours of operation are Monday - Friday from 8:30 a.m. - 5:45 p.m. and Saturday from 9:00 a.m. - 5:00 p.m. Eastern time.

NLM Publications on PubMed
National Library of Medicine
NLM Technical Bulletins

References

Search Strategy Used to Create the Systematic Reviews Subset on PubMed

This strategy is intended to retrieve citations identified as systematic reviews, meta-analyses, reviews of clinical trials, evidence-based medicine, consensus development conferences, and guidelines and citations to articles from journals specializing in review studies of value to clinicians. This subset can be used in a search as systematic [sb].

Example: exercise hypertension AND systematic [sb]

This subset is not available on the Limits screen. It is available on the Clinical Queries screen. For additional sources of strategies for systematic review, please see the list of related sources.

Strategy last modified March 2008.
Test Drive: PubMed Systematic Reviews

- **Patient/Problem:** Pain, Infant
- **Intervention:** Sucrose
- **Comparison:** none
- **Outcome:** Effectiveness of therapy to ease pain
Health Services Research Filters for PubMed (Beta)

- Provider: National Information Center on Health Services Research & Health Care Technology
- Use for quality-related and cost-related queries
myocardial infarction angioplast* thromboly*
Appraising Evidence

- Is the information valid?
  - Evidence
  - Conclusions
- Are the results clinically important?
- Are the results applicable to my patient?

Appraising the Evidence: Therapy

- Randomization
- Patient Follow-Up
- Analysis of Patients
- Blinding
- Baseline characteristics of patients
- Treatments
- Importance of valid results
- Applicability to patient

### Appraising Evidence: Resources

- Users’ Guides to Medical Literature (JAMA, 1993-2000)

### Summary of EBM Method

| Assess patient | • In patients with myocardial infarction, is PTCA as effective as thrombolytic therapy for treatment? |
| Ask clinical questions | • Find answers using pre-appraised evidence resources (EBM Reviews), Medline, PubMed, etc. |
| Acquire the evidence |  |
| Appraise the evidence |  |
| Apply evidence to patient care |  |
Questions?

- Evidence-Based Practice Resources at hml.org
  - Tutorials
- Workshop Page
- Contact Carolyn
  - Phone: 536-9302, x113
  - Email: ching@hml.org

Optional Exercises

- What is the risk of breast cancer for women taking combination hormone replacement therapy?
- In 30-50 year olds, does having hypertension affect your risk of acute myocardial infarction?
Mahalo!