Critical Appraisal 101: Evidence Appraisal for the Non-Researcher

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Disclosures

No conflicts of interest to declare.

I am a CADTH employee.

CADTH is an independent, not-for-profit agency that delivers timely, evidence-based information to health care leaders about the effectiveness and efficiency of health technologies.
Learning Objectives

Participants will:

• appreciate the importance of critical appraisal
• understand important differences between different types of research
• use practical methods for evaluating some of the most common types of publications.
“…now we are drowning in information, thirsting for evidence, ah, such is the paradox of this information age.

…Between 20,000 and 30,000 biomedical journals and about 17,000 new biomedical books are published annually…”

Obstacles to evidence-based decision-making

- Uncertain credibility of some sources
- Challenging to identify differences among multiple research methodologies
- Not certain if study results have been unduly influenced
- Difficult to know if there is missing information in some studies
Outline

What research is out there?

How do I find it?

How do I know if it’s reliable?

• Can I believe the results?
• What are the results?
• Can the results help me in my decision-making?
What Research Is Out There?
Standard Hierarchy of Evidence

“health technology assessment”

reference [http://ebp.lib.uic.edu/dentistry/?q=node/12](http://ebp.lib.uic.edu/dentistry/?q=node/12)
Other considerations

- Peer-reviewed vs non-peer-reviewed
- Grey literature
- Conference abstracts
- Non-systematic reviews
- Meta-analysis
- Clinical practice guidelines
- Qualitative research
Systematic Reviews (SRs)

A synthesis of several research trials on a particular subject using thorough/structured methods to search and use relevant trial information.

Statistical methods (meta-analysis) may or may not be used to analyze and summarize the results of the included studies. (Veterans Affairs, USA)

Considered to be one of the highest levels of evidence... if conducted properly and in a structured way!
Clinical Practice Guidelines (CPGs)

CPG’s are documents that intend to guide clinical decisions regarding diagnosis, management, and define appropriate treatments (AGREE Collaboration, 2003).

Risk of bias associated with process and group decision-making can impact the quality and applicability

Years ago, CPGs were based mainly on expert authority, however, more modern processes include careful selection and scrutiny of evidence by committee, recommendations with ratings of quality, and consensus, and cost impact.

Intended to be ACTIONABLE, CPGs often now include practical implementation recommendations for initiating practice change

Qualitative Research Studies

Explore verbally-reported findings including perceptions, feelings, preferences, trends, and other phenomena that cannot be adequately measured with NUMBERS.

Provide data to research questions that cannot possibly be measured by RCTs. This includes identifying themes, unexpected impacts, patient satisfaction, improvement in staff morale, etc.

Have been negatively viewed for many years as non-valid evidence, but qualitative research is rapidly evolving. Now recognized as its own science with credibility and significant value for decision-making.
Qualitative: a different kind of research

“a form of systematic empirical inquiry into meaning”

• systematic: meaning “planned, ordered, and public,” following rules agreed upon by researchers

• empirical: meaning a type of inquiry is grounded in observation or experimentation (not just theory)

• inquiry into meaning: says researchers try to understand how others make sense of their experience

“This means that qualitative researchers study things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them.”

How do I find it?
Think about the question.

P – patient

I – intervention

C – comparator

O – outcome
Get help from a medical librarian.
<table>
<thead>
<tr>
<th>Search Strategy</th>
<th>Syntax Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1. At the end of a phrase, searches the phrase as a subject heading</td>
</tr>
<tr>
<td>2.</td>
<td>2. Floating subheading</td>
</tr>
<tr>
<td>3.</td>
<td>3. S: Truncation symbol, or wildcard: retrieves plural or variations of a word</td>
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<tr>
<td>4.</td>
<td>4. *: Indicates that the marked subject heading is a primary topic</td>
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<tr>
<td>5.</td>
<td>5. 7: Truncation symbol for one or no characters only</td>
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<tr>
<td>6.</td>
<td>7. ADJ: Requires words that are adjacent to each other (in any order)</td>
</tr>
<tr>
<td>7.</td>
<td>8. .ab: Abstract</td>
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<tr>
<td>8.</td>
<td>9. .hw: Heading Word: usually includes subject headings and controlled vocabulary</td>
</tr>
<tr>
<td>9.</td>
<td>10. .pt: Publication Type</td>
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<td>10.</td>
<td>11. .an: CAS registry number</td>
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<table>
<thead>
<tr>
<th>Databases</th>
<th>Syntax Guide</th>
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<tr>
<td>Medline (In-Process &amp; Other Non-indexed Citations and OVID Medline (1948 to Dec 2, 2011), Embase (1947 to Dec 02, 2011), Wiley Cochrane Database for Systematic Reviews, DARE (Database of Reviews of Effectiveness)</td>
<td>1. (review or review, tutorial or review, academic).pt.</td>
</tr>
<tr>
<td>Embase (1947 to Dec 02, 2011), Wiley Cochrane Database for Systematic Reviews</td>
<td>2. (medline or medians or embase or pubmed or cochrane).tw.sh.</td>
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<tr>
<td>DARE (Database of Reviews of Effectiveness)</td>
<td>3. (research or psychinfo or psycinfo).tw.sh.</td>
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<tr>
<td>COCHRANE</td>
<td>4. (psychlit or psych).tw.sh.</td>
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<tr>
<td>CAS registry number</td>
<td>5. cnah.tw.sh.</td>
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<tr>
<td>6. ((hand adj2 search$) or (manual adj2 search$)).tw.sh.</td>
<td>7. (electronic database$ or bibliographic database$ or computer?ed database$ or online databases$).tw.sh.</td>
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<td>8. (pooling or pooled or mantei naenece$).tw.sh.</td>
<td>9. (ptco or deronimian or dor simonian or fixed effect$).tw.sh.</td>
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<tr>
<td>10. (transition of publication or retracted publication).pt.</td>
<td>11. or2-10</td>
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<tr>
<td>12. 1 and 11</td>
<td>13. meta-analysis.pt.</td>
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<td>14. meta-analysis.sh</td>
<td>15. (meta-analysis$ or meta$ or metaanaly$ or metaanalysis$).tw.sh.</td>
</tr>
<tr>
<td>22. (methodologic$ adj5 overview$).tw.sh.</td>
<td>23. (integrative research reviews or research integration).tw.sh.</td>
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<tr>
<td>24. or12-23</td>
<td>25. 12 or 24</td>
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<tr>
<td>26. &quot;randomized controlled trial&quot; pt.</td>
<td>27. (random$ or placebo$ or single blind$ or double blind$ or triple blind$).t.ab.</td>
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<tr>
<td>28. (retraction of publication or retracted publication).pt.</td>
<td>29. or20-28</td>
</tr>
<tr>
<td>30. (animals not human$).sh.</td>
<td>31. ((comment or editorial or meta-analysis or practice-guideline or review or letter or journal</td>
</tr>
<tr>
<td>32. (random sample$ or random digit$ or random effect$ or random survey or random regression).t,ab.</td>
<td>33. not &quot;randomized controlled trial$&quot;.pt.</td>
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<tr>
<td>34. (oral or direct) adj5 (Xa inhibitors$ or drug$).t,ab.</td>
<td>35. (factors or antifactor$) adj5 (Xa inhibitors$ or drug$).t,ab.</td>
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<tr>
<td>36. (edoxaban or rivaroxaban).t,ab.</td>
<td>37. DU170b.mp.</td>
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<td>38. 30 or 37</td>
<td>39. (apixaban or enoxaparin).t,ab.</td>
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<td>41. (danaparoid or pradaxa or pradax or pradaxa).t,ab.</td>
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<td>43. (marcelabam or sarepta).t,ab.</td>
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<td>44. BAY63-7006.mp.</td>
<td>45. or34-44</td>
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<td>46. 45 and 25</td>
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<td>51. epidemiologic methods</td>
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<td>53. exp case-control studies/</td>
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<tr>
<td>54. (case and control).tw.</td>
<td>55. or36-50, 52-54</td>
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<tr>
<td>56. 46 and 55</td>
<td>57. (ae or si or to or co).fs.</td>
</tr>
<tr>
<td>58. (safe or safety).t,ab.</td>
<td>59. side effects.t,ab.</td>
</tr>
<tr>
<td>60. ((adverse or undesirable or harm$ or serious or toxic) adj3 (effect$ or reaction$ or event$ or outcome$)).t,ab.</td>
<td>61. exp product surveillance, postmarketing/</td>
</tr>
<tr>
<td>62. exp adverse drug reaction reporting systems/</td>
<td>63. exp clinical trials, phase iv/</td>
</tr>
<tr>
<td>64. exp poisoning/</td>
<td>65. exp substance-related disorders/</td>
</tr>
<tr>
<td>66. exp drug toxicity/</td>
<td>67. exp abnormalities, drug induced/</td>
</tr>
<tr>
<td>68. exp drug monitoring/</td>
<td>69. exp drug hypersensitivity/</td>
</tr>
</tbody>
</table>
| 70. (toxicity or complications or noxious or tolerability).t,ab. | 71. exp Postoperative Complications/
| 72. exp Intraoperative Complications/ | 73. or57-72 |
| 74. or36-44 | 75. (73 and 74) not (58 or 46 or 47) |
Finding the Evidence: 
Tools from CADTH’s information specialists

- [www.cadth.ca/en/resources/finding-evidence-is](www.cadth.ca/en/resources/finding-evidence-is)
  - Grey Matters – a tool for searching the grey literature
  - PRESS – a checklist for peer review of search strategies
  - Strings Attached – a list of search filters developed by CADTH’s information specialists

  - archived webinar based on a series of workshops held in Feb/Mar 2014
How do I know if it’s reliable?
Why Critical Appraisal?

“Critical appraisal provides an effective filter for the reliability and validity of health care research that screens out about 98% or more of the medical research literature as not being ready for clinical use”  
Haynes, R. B. (2002). BMC Health Services Research 2(3)

“Only 6.8% of published research is of high quality and is clinically relevant”  

Critical appraisal can help us to decide whether we think an article is good enough to be used in decision making.
Critical Appraisal

- Is the process of systematically examining research evidence for validity, credible results, and relevance before using it to inform a decision
- It is essential for true evidence-informed decision making
- Critical Appraisal requires the selection of an appropriate Critical Appraisal Tool (CAT) is the key!
Let’s simplify!
Our Introductory Approach to Critical Appraisal

- Can I believe the results?
- What are the results?
- Will the results help me in my decision making?
Validity

Internal Validity

• Truth within a study

• A study is internally valid if results were not likely due to the effects of chance, bias, or confounding.

• Are the design, execution, and analysis of the research correct?

External Validity

• A study is externally valid if it represents the population to which the results will be applied.

• Are the study population and reader’s population similar?
Is the article relevant to my decision or patients?

Is the article of good methodology?

How large is the treatment effect?

BELIEVABILITY (Internal validity)

RESULTS

RELEVANCE (External validity)
Can I believe the results?

Did the study address a clearly focused question?

Did the researchers use the right type of design?
  • Consider control groups, randomization, blinding, follow-up.

Is the intervention clearly defined?

Are all outcomes and assessments clearly defined?

Is the work reproducible?

Is there likely to be bias?
What are the results?

Did the findings answer the original research questions?

How significant is the overall effect?
  • Consider the magnitude of difference between the groups.

How precise are the results?
  • Consider statistical significance (p values, confidence intervals).

What is the real clinical value of the treatment?
Will the results help me in my decision making?

Are inclusion and exclusion criteria clearly defined?

Were clinically important outcomes considered?

Were subgroup analyses carefully interpreted?

Do the conclusions flow from the data?

Can the conclusions be generalized to other clinical settings, such as mine?

Are benefits worth the risks?
Questions?
For More Information

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