



Demystifying Research: Simplifying Critical Appraisal

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Introduction

This paper aims to provide guidance to nurses, physicians, medical librarians, and others in the healthcare community on how to evaluate evidence-based research and integrate it into clinical practice in order to improve healthcare outcomes. Readers will come away with a critical understanding of what it takes to translate evidence into actionable clinical techniques that reduce medical errors and alter the way their healthcare institution operates.

The paper begins with a workable definition of evidence-based research, along with a brief history of its origins. Steps on how to integrate evidence into clinical practice are then presented. The bulk of the paper outlines, in step-by-step form, how to critically appraise the research evidence, using real-world examples.

This paper is based on a live webcast, **Demystifying Research: Simplifying Critical Appraisal**, which was sponsored by Ovid and Lippincott Williams & Wilkins and originally broadcast **March 7, 2012**. The following individuals participated in the webcast discussion:

- **Anne Dabrow Woods**, MSN, RN, CRNP, ANP-BC, Chief Nurse of Lippincott Williams & Wilkins and Ovid, and publisher of *AJN: American Journal of Nursing*
- **Ellen Fineout-Overholt**, PhD, RN, FNAP, FAAN, Dean & Professor of the Groner School of Professional Studies and Chair, Department of Nursing, at East Texas Baptist University
- **Maureen "Shawn" Kennedy**, MA, RN, Editor-in-Chief of *AJN: American Journal of Nursing*

Other sources include the "Evidence-Based Practice" series from *AJN: the American Journal of Nursing*, one of the leading nursing journals in the world, published November 2009-September 2011, and *Evidence-Based Practice in Nursing and Healthcare: A Guide to Best Practice*, 2nd edition.

Origins of Evidence-Based Research and Practice

The notion of using evidence-driven medical research as the basis for clinical practice is largely attributed to the work of British epidemiologist Archie Cochrane in the 1970s. In analyzing outcomes at hospitals and healthcare facilities in the United Kingdom, he observed that much healthcare practiced at the time wasn't based on enough empirical evidence to justify its continued use; practitioners were using the same techniques because they simply had been performed that way. Cochrane discovered that patients whose care was supported by evidence received higher quality care and had better outcomes than patients who did not. In addition, evidence-based care improved overall cost efficiencies at the hospital.

Cochrane's work had a profound impact on the healthcare community, generating a now widely accepted shift toward an evidence-based approach to delivering care. Evidence-Based Practice (EBP) is nowadays defined as combining the following three criteria:

1. Evidence derived from empirical research
2. Expertise of the clinicians delivering the care
3. Preferences of the patient



It is now commonly believed that evidence-based research can be drawn from multiple healthcare specialties not only in medicine, but also from nursing and allied health. Though this means clinicians may feel daunted by the enormous repository of information to choose from, there are now accepted methodologies for assessing evidence to make it easier to translate it into practice.

Canada's **McMaster University**, for example, has developed a multi-part hierarchical pyramid to aid in this assessment. At the bottom—the foundation for all evidence—is original research, the groundbreaking studies published in medical and nursing journals all over the world. The next level of the pyramid contains summaries, systematic reviews, analyses, and meta-analyses of the original research. At the top is information intended for use at the point of care—information found in clinical decision support tools such as UpToDate® and the various clinical practice guidelines.

Another methodology for aiding clinicians in assessing research has come from the **United States Preventive Services Task Force** (part of the United States government's Department of Health & Human Services), which developed an easy-to-follow grading system:

- **Level A** - Very good evidence that the benefits of healthcare intervention substantially outweigh the risks
- **Level B** - Sound and fair evidence that the benefits of healthcare intervention outweigh the risks
- **Level C** – Evidence illustrating a balance between the benefits and risks of healthcare intervention; the clinician should consider individual patient factors
- **Level D** – Evidence illustrating the risks of healthcare intervention far outweigh the benefits

In the end, though, the most important consideration for clinicians when reviewing evidence is to focus on what clinical question they're trying to answer—regardless of where the evidence comes from—and whether it's relevant to the patient case.

Translating Evidence Into Practice

Evidence-based research is an excellent mechanism for effecting sustainable institutional change where healthcare outcomes improve across patients and from patient to patient. Evidence-based practice (EBP) is predicated on the idea that there is clinical value to this research evidence, external to the study in which it is found.

However, clinicians frequently find it challenging to translate the evidence into clinical care. The following is a seven-step system for doing just that:

1. **Cultivate a spirit of inquiry** - interest often sparks a question that leads to a fundamental change in clinical practice
2. **Ask a specific clinical question in the PICOT format** – this time-saving approach to specificity ensures that all of the elements of the clinical issue are addressed (**P**atient population; **I**ntervention or issue of interest; **C**omparison intervention or issue of interest; **O**utcome(s) of interest; and **T**ime it takes for the intervention to achieve the outcome)
3. **Search for and collect the most relevant and best evidence**
4. **Critically appraise the evidence**
5. **Integrate the best evidence with the healthcare provider's experience/ expertise and patient preference**
6. **Evaluate outcomes of the practice decision**
7. **Disseminate the outcomes of the EBP decision**

Of these steps, the fourth step has proven to be the most challenging for clinicians.

Critically Appraising Evidence

Critical appraisal is driven by the fundamental notion that evaluated, relevant research is integral to successful patient outcomes—outcomes that can also be replicated in a similar clinical situation.



Therefore, those who analyze research evidence must be able to determine whether the studies are not only reliable and valid, but also applicable—generalizable—to their patients. Only then can the studies be useful for actual decision-making in a clinical setting.

Clinicians often cite similar objections to critical appraisal. These include: 1) it's too time-consuming; 2) it's too difficult; 3) only an "expert" in EBP can do critical appraisal in any meaningful way; and 4) truly meaningful critical appraisal requires expertise in statistics. However, the following three basic steps go a long way toward acquiring a basic skill set in critical appraisal while overcoming these objections:

1. **Rapidly and critically appraise research studies**
2. **Evaluate and analyze the studies relevant to clinical situation**
3. **Synthesize the studies and determine the best clinical recommendations**

Rapid Critical Appraisal (RCA)

This first step is actually composed of two parts. The first enables clinicians to identify, from the enormous quantities of published research, those studies that are most relevant to the specific clinical question at hand and are valid. These studies are called "keeper studies." The second part involves the appraisal of the keeper studies.

Keeper studies can be identified using handy Rapid Critical Appraisal checklists consisting of a set of simple but important questions. Below are sample questions developed for use with quantitative studies that are applicable to most appraisal situations (it's important to note that qualitative evidence, if it's relevant to the clinical question, should not be dismissed):

1. **Why was the study done?**
Make sure the study is directly relevant to the clinical question.
2. **What is the sample size?**
Size can and should vary according to the nature of the study. Since determining a valid minimum sample size in a single study can be difficult, taking into account multiple studies is beneficial.

The answer to this question alone should not remove a study from the appraisal process.

3. **Are instruments of the variables in the study clearly defined and reliable?**

Make sure the variables were consistently applied throughout the study and that they measured what the researchers said they were going to measure.

4. **How was the data analyzed?**

Make sure that any statistics are relevant to the clinical question.

5. **Were there any unusual events during the study?**

If the sample size changed, for example, determine whether that has ramifications if you wish to replicate the study.

6. **How do the results fit in with previous research in this area?**

Make sure the study builds on other studies of a similar nature.

7. **What are the implications of the research for clinical practice?**

Ask whether the study addresses a relevant and important clinical issue.

Once keeper studies have been identified, it's time to analyze them using a similar set of RCA questions, but ones that enable clinicians to further hone a study's applicability to a clinical situation. Below are sample questions—along with sample related sub-questions—taken from the appraisal of study presenting the results of a randomized clinical trial for a drug*:

1. **Are the study's findings valid?**
Specific sub-questions asking about the participants of the study, the demographic make-up of the control group, and other variables provide further guidance.



2. What are the results of the study and are they important?

Readers should also pay attention to the size and significance of the healthcare intervention or treatment proposed, the specific statistics relevant to the clinical situation, and more.

3. Will the results actually help clinicians care for patients?

Clinicians should determine whether the results are applicable to his or her set of patients, identify the risks and benefits of the specific treatment recommended, and analyze whether the treatment conforms to patient preferences is feasible within the institution.

*It is also important to recognize that the funding organization behind the study is a factor in determining the reliability of a study. Clinicians may question studies funded by private entities such as pharmaceutical companies, which may have profit-driven reasons for ensuring positive outcomes.

Evaluation

Once keeper studies have been identified and answers to Rapid Critical Appraisal questions have been accumulated, it's time to holistically evaluate the acquired evidence. To do so, it is recommended to create evaluation tables to more easily review, at a glance, information from multiple studies.

Only essential information should be input into the evaluation tables. What is considered "essential" may vary according to the both the nature of the RCA as well the clinical situation. However, the following are sample evaluation table elements that should be considered:

- Article citation
- Conceptual framework, hypothesis, and design of the study
- Details on the survey sample, such as the number of participants, demographic characteristic of the participants, and how the samples were sampled
- Study setting, which is useful for relating to the patient population

- Study measurements, such as the equipment used
- Data statistics
- Study findings and conclusions
- Level and quality of the evidence, based on the strengths, risks, and limitations of the treatment, as well as the feasibility of its use in the institution

Key to a comprehensive evaluation table that can be reviewed quickly by multiple clinicians is a detailed yet easy-to-understand legend that identifies any acronyms or abbreviations.

Synthesis

The next step is to distill all of the essential information from the evaluation tables and provide clinicians with an actionable set of evidence that makes sense for the specific clinical question, and that they can confidently use in a specific healthcare intervention.

This part of the process, too, employs the use of tables, each one corresponding to one element in an evaluation table, such as the level and type of evidence. To maximize speed and efficiency, it's advisable to identify whether or not like-minded studies can be clustered together or even consolidated. Examples of studies that can be clustered include those with similar designs, similar target interventions, or outcomes measured in a similar way.

Evidence synthesis allows clinicians to spot inconsistencies across multiple studies, identify which—if any—studies should be removed from the analysis, and come to a consensus on the outcomes and findings from each study. Most importantly, perhaps, synthesis generates confidence among clinicians as to how they'll implement the evidence they're reviewing, keeping in mind the feasibility of the treatment and the associated risks.



Conclusion: The Power of Clinical Decision-Making Based on Critically Appraised Evidence

Statistics indicate that in the United States nearly 100,000 people die annually from medical errors. Critically appraised evidence is an important mechanism in the larger process of Evidence-Based Practice, which lies at the intersection of research, clinical practice, and healthcare education (through dedicated curricula at both the baccalaureate and graduate levels) and is a key step in combating this grim statistic. Though Institutional change is never easy, the onus is on all healthcare professionals to be willing to start by asking a simple question.

Evidence-Based Nursing and Medicine Resources from LWW and Ovid

The following list includes resources referenced in this paper, as well as others covering evidence-based research and practice. Resources featuring examples of RCA questionnaires, evaluation tables, and synthesis tables are noted accordingly.

Journals:

- **AJN: American Journal of Nursing**
<http://journals.lww.com/ajnonline>
the “Evidence-Based Step-by-Step” series includes sample Rapid Critical Assessment (RCA) guides, evaluation tables, and synthesis tables
- **Pacesetters**
<http://journals.lww.com/jbipacesetters/pages/default.aspx>
- **International Journal of Evidence-Based Healthcare**
<http://www.ovid.com/site/catalog/Journal/2811.jsp>
- **Evidence-Based Medicine**
<http://www.ovid.com/site/catalog/Journal/1269.jsp?top=2&mid=3&bottom=7&subsection=12>

Databases:

- **Evidence-Based Medicine Reviews (EBMR)**
<http://www.ovid.com/site/catalog/DataBase/904.jsp?top=2&mid=3&bottom=7&subsection=10>
- **Ovid MEDLINE (includes integration with EBMR Topic Reviews) -**
<http://www.ovid.com/site/catalog/DataBase/901.jsp?top=2&mid=3&bottom=7&subsection=10>

Books:

- **Evidence-Based Practice in Nursing and Healthcare: A Guide to Best Practice, 2nd edition**
http://www.lww.com/webapp/wcs/stores/servlet/product_Evidence-Based-Practice-in-Nursing-&-Healthcare_11851_-1_12551_Prod-9781605477787

Websites:

- **Evidence-Based Practice Network** for peer-reviewed information—including continuing education, access to evidence-based practice resources, and conference information—to implement research into practice. The Network is powered by the Joanna Briggs Institute, one of the world’s largest repositories of evidence-based research, and accessible via NursingCenter.com.
- **www.nursingcenter.com** to sign up for Lippincott NursingCenter eNews, a free e-newsletter delivered every other week, packed with timesaving clinical and topical news, research findings, new CEs and articles, job opportunities, updates, and more.
- **www.ovid.com/nursing** for more information about Nursing@Ovid and the books, journals and databases available for subscription and purchase at your institution.



About the Webcast

Demystifying Research: Simplifying Critical Appraisal was broadcast March 7, 2012 to a live audience of more than **4,000** healthcare practitioners and educators from all over the world. To view the archived webcast (available through March 2013) or listen to a podcast version, visit the Ovid Resource Center at <http://resourcecenter.ovid.com>.

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