Assessing the Effectiveness of an Evidence-Based Practice (EBP) Pharmacology Course: The Experience of a Cross-Institutional Collaborative Instruction Team

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Outline

• Background
• Logistics of EBP-Pharmacology Course
• Assessment of EBP Skills
• Development of Search Skills Grading Rubric
• Assessment of Search Skills Grading Rubric
• Summary and Conclusions
• Future Directions
Design and Instruction Team

MCPHS

Massachusetts College of Pharmacy and Health Sciences

Worcester Campus

School of Pharmacy
Alice Gardner
Monina R. Lahoz

Blais Family Library
Irena Bond

Len Levin

Lamar Soutter Library
A Legacy of Service and Learning
Elective Course

• Evidence-Based Pharmacology
• 2 SH credits (2-hour session per week for 14 weeks)
• Mode of delivery:
  o Weeks 1-3: Focused, hands-on instruction on the EBP Process
  o Weeks 4-12: Three 3-week case-based clinical pharmacology modules
  o Weeks 13-14: Group poster presentations
• Required textbook:
• Doctor of Pharmacy students
  o Y1 = 3 groups, n = 12
  o Y2 = 3 groups, n= 9
Elements of evidence-based learning

• **Asking** – converting the clinical puzzle into an answerable question

• **Accessing** – searching to find the answer to that question

• **Appraising** – critically evaluating the evidence to decide if it is, and if so how, reliable and robust

• **Applying** – extracting the useful information and addressing the issues of “generalisability” and “particularis-ability” to decide what clinical action is best

• **Assessing** – evaluating the process to integrate this element into the quality improvement cycle

Assessment of EBP Skills

• Instrument - **Fresno Test**
  - A performance-based measure to test EBP knowledge and skills
  - Open-ended questions are scored with standardized grading rubrics. Calculation skills are assessed by fill in the blank questions.
  - Shown to be a reliable and valid test for detecting the effect of EBP instruction

• Administered weeks 1 and 14 (Y1 and Y2)

## Assessment of EBP Skills

<table>
<thead>
<tr>
<th>EBP Element</th>
<th>Fresno Test Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask</td>
<td>Q1: PICO question format</td>
</tr>
</tbody>
</table>
| Access      | Q2: Strengths & weaknesses of information sources in clinical practice  
|             | Q3: Appropriateness of study designs  
|             | Q4: Medline searching for original research |
| Appraise    | Q5: Relevance of study variables & subjects to practice  
|             | Q6: Internal validity of the study  
|             | Q7: Clinical significance, size and statistical significance of a reported effect |
| Apply       | Q5: Relevance of study variables & subjects to practice |

Hidden slide – Fresno Test

• There are 7 short answer questions and 3 fill-in-the-blank questions. Allow yourself at least **20-30 minutes to complete** the test.

• **Answer Questions 1-4 based on the following clinical scenarios:**

  • **CASE 1** - You have just seen Lydia who recently delivered a healthy baby. She plans to breastfeed, but also wants to start oral contraception. You generally prefer to prescribe combination oral contraceptives (estrogen + progesterone) but you have been told that these might more negatively affect her breastmilk production than progesterone only pills.

  • **CASE 2** - John is an 11 year old boy who presents with primary enuresis. He has grown frustrated with the inconvenience and embarrassment of his problem. You have excluded the possibility of urinary tract anomalies and infection as possible causes. You consider recommending a bedwetting alarm, but a colleague tells you he thinks they’re “worthless” and suggests that you treat with imiprmine or desmopressin.
Q1. Write a focused clinical question for each of these patient encounters that will help you organize a search of the clinical literature for an answer and choose the best article from among those you find.

Case 1

Case 2
Case 1 - Scoring Rubric for breast-feeding/contraception question. *(When in doubt, consider whether what is written will contribute to an optimally specific search of the clinical literature.)*

<table>
<thead>
<tr>
<th>Population</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent (3 pts)</td>
<td>Multiple relevant descriptors e.g., “post partum woman,” “breast feeding/lactating mother” or “breastfeeding mom desiring contraception,” or “breast fed newborn” <em>Note: “breastfeeding woman” is considered two descriptors.</em></td>
<td>Includes specific intervention of interest; e.g. <em>combined contraceptives</em> (estrogen and progesterone), or specific individual components of contraception such as “estrogen”</td>
<td>Outcome that is objective and meaningful to patient e.g. infant growth rate, number of lactation “drop outs,” or maternal satisfaction with infant satiety or milk flow</td>
</tr>
<tr>
<td>Strong (2 pts)</td>
<td>One appropriate descriptor as above examples e.g. “woman,” or “infant” or “breastfeeding”</td>
<td>Mentions <em>contraception</em> or type of intervention, e.g. <em>oral contraceptives</em>, or <em>hormones</em></td>
<td>Non-specific outcome - e.g. “milk” or “breast feeding” OR Disease oriented outcome such as milk volume without accompanying measure of clinical relevance - e.g. “milk volume” or “chemical composition of milk” or “breastmilk production”</td>
</tr>
<tr>
<td>Limited (1 point)</td>
<td>A single general descriptor unlikely to contribute to search e.g. “patient”</td>
<td>Mentions intervention but unlikely to contribute to search e.g. “methods” “options” “treatments”</td>
<td>Reference to outcome, but so general as to be unlikely to contribute to search e.g. “effects” “change the outcome”</td>
</tr>
<tr>
<td>Not Evident (0 pts)</td>
<td>None of the above present</td>
<td>None of the above present</td>
<td>None of the above present</td>
</tr>
</tbody>
</table>
Fresno Test – Step 2 (Access)

- Question 2: Where might clinicians go to find an answer to questions like these? Name as many possible types or categories of information sources as you can. You may feel that some are better than others, but discuss as many as you can to demonstrate your awareness of the strengths and weaknesses of common information sources in clinical practice. Describe the most important advantages and disadvantages for each type of information source you list.

- Question 4: If you were to search Medline for original research on one of these questions, describe what your search strategy would be. Be as specific as you can about which topics and search categories (fields) you would search. Explain your rationale for taking this approach. Describe how you might limit your search if necessary and explain your reasoning.
Question: Where might clinicians go to find an answer to questions like these? Name as many possible types or categories of information sources as you can. You may feel that some are better than others, but discuss as many as you can to demonstrate your awareness of the strengths and weaknesses of common information sources in clinical practice. Describe the most important advantages and disadvantages for each type of information source you list.
**Fresno Test – Step 2 (Access): Question 2 - scoring**

<table>
<thead>
<tr>
<th>Category</th>
<th>Variety of Sources</th>
<th>Convenience</th>
<th>Clinical Relevance</th>
<th>Validity</th>
</tr>
</thead>
</table>
| Excellent (6 points) | At least four types of sources listed. Types include:  
• electronic databases of original literature (Medline, Embase, CINAHL)  
• journals (JAMA, NEJM)  
• textbook (Merck, monographs)  
• Systematic Reviews (Cochrane)  
• EBM publications or databases of pre-appraised information (Best Evidence, InfoRetriever, DynaMed, EBM, ACPJC, EB, Clinical Evidence)  
• Medical website (MDConsult, PraxisMD, SumSearch)  
• General internet search (google, yahoo)  
• Clinical Guidelines (Guideline Clearinghouse,  
• Professional Organization (AAFP, La Leche League, NIH website)  
• People (colleague, consultant, attending, librarian) | Discussion includes at least 2 specific issues related to convenience, or mentions the same issue while discussing two different sources. Issues may include:  
• Cost (e.g. “free,” “subscription only”)  
• Speed (e.g. “fast,” “takes time”)  
• Ease of search (e.g. “must know how to narrow search,” “easy to navigate”)  
• Ease of use (e.g. “concise” and “NNTs already calculated”)  
• Availability (e.g. “readily available online”) | Discussion includes at least 2 specific issues related to relevance, or mentions the same issue while discussing two different sources. Issues may include:  
• Clinically relevant outcomes  
• Written for clinical application (e.g. “pertinent” “info on adverse effects” or “has patient information sheets”)  
• Appropriate specialty focus (e.g. “directed at FP’s”)  
• Information applicable to patient in question (e.g. “can go over details of this particular patient” or “most of studies are from ”)  
• Includes specific interventions in question  
• Specificity (overview vs. targeted) (e.g. “can get basic information” or “more specialized”)  
• Comprehensiveness of source (likelihood of finding an answer in that source) (e.g. “she can find anything” or “contains usable references” or “not likely to have answer to this question”) | Discussion includes at least 2 specific issues related to validity, or mentions the same issue while discussing two different sources. Issues may include:  
• Certainty of validity (e.g. quality is uncertain” or “has not been screened” or “needs to be critically appraised”)  
• Evidence Based approach (e.g. “evidence based” or “Grade 1 Evidence” or “no references provided”)  
• Expert bias (e.g. “usually just someone’s opinion”)  
• Systematic approach  
• Peer review  
• Ability to verify  
• Standard of care (e.g. “accepted in medical community”)  
• Enough information provided to critique validity (e.g. “abstract only” or “not available full-text”)  
• Up-to-date/outdated (e.g. “most recent research”) |
| Strong (4 points) | Three types of sources listed. | Includes 1 specific issue/explanation related to convenience | Includes 1 specific issue/explanation related to relevance | Includes 1 specific issue/explanation related to validity |
| Limited (2 points) | Two types of sources listed. | Mentions convenience involved in using one or more source, but without explanation e.g. “convenient” or “easy” or “difficult” | Mentions relevance of using one or more source, but without explanation e.g. “relevant” | Mentions validity of using one or more source, but without explanation e.g. “good” “junk” |
| Not Evident | No variety. Only one source listed, or all sources of same type. | No mention of convenience | No mention of relevance | No mention of validity |
Question: If you were to search Medline for original research on one of these questions, describe what your search strategy would be. Be as specific as you can about which topics and search categories (fields) you would search. Explain your rationale for taking this approach. Describe how you might limit your search if necessary and explain your reasoning.
## Fresno Test – Step 2 (Access): Question 4 - Scoring

<table>
<thead>
<tr>
<th></th>
<th>Search Terms</th>
<th>Tags</th>
<th>Delimiters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excellent (8 pts)</strong></td>
<td>3 or more terms that reflect patient, intervention, comparison, and outcome (PICO) being considered</td>
<td>Description of search strategy reflects understanding that articles in database are indexed by more than one field. Discusses one or more field/index/tag by name (MeSH, Title Word, Publication Title, language, Keyword, author, Journal title, etc.) and provides plausible rationale for search strategy using 1 or more of these indices e.g. “keyword is less specific than MESH”</td>
<td>Describes more than one approach to limiting search (e.g., “limit to human” or “adult” or “English”), names a specific publication type, or describes of Clinical Queries in PubMed, or the use of Boolean operators or search combinations or includes terms related to an optimal study design (e.g. randomized) or suggests use of subheadings. *NOTE: If the subject includes the name of the index when describing a delimiter (e.g. “check language as English”) then we give credit for a tag as well as a method of delimiting.</td>
</tr>
<tr>
<td><strong>Strong (6 pts)</strong></td>
<td>2 terms from PICO</td>
<td>Names 1 or more field or index category but does not provide plausible defense of search strategy based on this knowledge e.g. “I would do a keyword search...”</td>
<td>Describes only 1 common method of limiting search</td>
</tr>
<tr>
<td><strong>Limited (3 pts)</strong></td>
<td>1 term from PICO</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Not evident (0 pts)</strong></td>
<td>Not present</td>
<td>No evident understanding that articles “tagged” by different fields or indices</td>
<td>No valid techniques for limiting a search listed</td>
</tr>
</tbody>
</table>
Fresno Test Pre- and Post-intervention Mean Scores – Total (Q1-Q7)

### Cumulative Scores

<table>
<thead>
<tr>
<th>Year</th>
<th>Pre-test (Q1-Q7)</th>
<th>Post-test (Q1-Q7)</th>
<th>Δ</th>
<th>Δ%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1</td>
<td><strong>50</strong></td>
<td><strong>100</strong></td>
<td>***</td>
<td>59.6%</td>
</tr>
<tr>
<td>Y2</td>
<td></td>
<td><strong>150</strong></td>
<td>***</td>
<td>30.2%</td>
</tr>
</tbody>
</table>

***, p<0.001, pre- versus post-test
Fresno Test Pre- and Post-intervention Mean Scores – Ask (Q1)

Q1: PICO question format

Cumulative Scores (Mean)

Pre-test (Q1)  Post-test (Q1)

Y1  
Δ9.2%  

Y2  
Δ51.6%

***, p<0.001, pre- versus post-test
Fresno Test Pre- and Post-intervention Mean Scores – Access (Q2, Q3, Q4)

Q2: Strengths & weaknesses of information sources

Q3: Study designs

Q4: Search strategy (Medline)

*, p<0.05; **, p<0.01, pre- versus post-test
Fresno Test Pre- and Post-intervention Mean Scores – Appraise (Q5, Q6, A7)

**Q5: Relevance of study**

- **Pre-test (Q5)**
- **Post-test (Q5)**

ΔΔ ΔΔ 24.8%

**Q6: Internal validity**

- **Pre-test (Q6)**
- **Post-test (Q6)**

Δ17.1%

**Q7: Clinical significance**

- **Pre-test (Q7)**
- **Post-test (Q7)**

Δ76.1%

* p<0.05, ** p<0.01, pre- versus post-test
Fresno Test

• Step 2 - Access (specifically Q2 and Q4) - assessed by medical librarians
  o Q2: Where might clinicians go to find an answer to questions like these? Name as many possible types or categories of information sources as you can. You may feel that some are better than others, but discuss as many as you can to demonstrate your awareness of the strengths and weaknesses of common information sources in clinical practice. Describe the most important advantages and disadvantages for each type of information source you list.
  o Q4: If you were to search Medline for original research on one of these questions, describe what your search strategy would be. Be as specific as you can about which topics and search categories (fields) you would search. Explain your rationale for taking this approach. Describe how you might limit your search if necessary and explain your reasoning.
**Fresno Test – Medical Librarians’ perspective**

- Limitations/Reasons for development of SSGR
  - Fresno scoring of Q2 and Q4 - cumbersome
  - Medline focused
  - Medical school focused
  - Primary research focused
  - Evidence (resource) hierarchy not emphasized
  - Does not capture key search basics

- For Y2, developed SSGR (Search Skills Grading Rubric)
  - Administered Weeks 6, 10 and 13
  - Scored by two medical librarians
## Y2 SSGR Elements

<table>
<thead>
<tr>
<th>Skill 1</th>
<th>Selecting appropriate sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill 2</td>
<td>Developing an appropriate search strategy</td>
</tr>
<tr>
<td>Skill 3</td>
<td>Using Boolean operators properly</td>
</tr>
<tr>
<td>Skill 4</td>
<td>Applying limits and filters</td>
</tr>
<tr>
<td>Skill 5</td>
<td>Refining the search</td>
</tr>
<tr>
<td>Skill 6</td>
<td>Retrieving relevant results</td>
</tr>
<tr>
<td>Skill 7</td>
<td>Managing the results</td>
</tr>
</tbody>
</table>
### SSGR – Skill 1

#### SOURCE SELECTION

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Partial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial resource is selected according to type of question – Cochrane or Medline for intervention, Medline for diagnosis, etiology, risk questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Search tracks down evidence according to source hierarchy - CDSR or Medline Clinical Queries -&gt;DARE-&gt;CENTRAL-&gt;Medline, Embase, CINAHL, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Publication bias is considered by searching and including grey literature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All relevant major databases of published studies are considered</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>Unsatisfactory</td>
<td>Acceptable</td>
<td>Very Good</td>
<td>Exceptional</td>
</tr>
<tr>
<td>0 criteria achieved</td>
<td>1 criterion achieved</td>
<td>2 criteria achieved</td>
<td>3 criteria achieved</td>
<td>4 criteria achieved</td>
</tr>
</tbody>
</table>

**Comments:**
Y2 SSGR Elements - Results

Cumulative and skill scores (1 to 3) were analyzed at weeks 1 ( ), 6 ( ), 10 ( ) and 13 ( ).

*, p<0.05; **, p< 0.01; ***, p<0.001, week 1 versus weeks 6, 10 and 13.
Skill scores (4 to 7) were analyzed at weeks 1 ( ), 6 ( ), 10 ( ) and 13 ( )
* , p<0.05; ** , p< 0.01, week 1 versus weeks 6, 10 and 13.
• Y1 and Y2 students demonstrated a significant increase in their EBP scores as measured by the Fresno test
• Composite SSGR scores increased significantly from week 1 to weeks 6, 10 and 13
• SSGR mean scores for skills 1 to 4 increased significantly from week 1 to weeks 6, 10 and 13
• SSGR mean scores for skills 5 and 6 increased significantly from week 1 to weeks 10 and 13
• SSGR mean scores for skill 7 increased significantly from week 1 to week 13
Conclusions

• The EBP Pharmacology elective course was effective in developing pharmacy students’ EBP skills, as measured by the Fresno test.

• The SSGR can be utilized as a supplement to the Fresno test or on its own to measure specific search skills within the EBP domain/step 1 and 2 (Ask and Access).
  – Explicit student feedback
SSGR Future Directions

• Use Y2 student feedback to refine instrument
• SSGR disseminated to expert EBP librarians
  – Pilot testing in 10 pharmacy and medical schools
  – If interested in pilot-testing the SSGR, please contact:
    • Irena Bond – Irena.Bond@mcphs.edu
    • Len Levin – Len.Levin@umassmed.edu