EVIDENCE BASED MEDICINE

For your Teaching, Research and Lifelong Learning

FID Series No. 3
Sam Keim, MD
Professor, Department Head, Emergency Medicine
University of Arizona College of Medicine
You mean this isn’t about Patient Care??
GAPS?

Got Gaps Worksheet
Today

- Overview of EBM paradigm
- EBM in your teaching
- EBM in your research
- A lifetime of learning
What is evidence-based medicine?

“Evidence Based Medicine”= “Science Based Medicine”

“Intuition and pathophysiology are insufficient grounds to make clinical decisions....clinical research evidence, if available, should be incorporated.”

“the conscientious, explicit, and judicious use of the best evidence in making decisions about the care of individualized patients.”

David Sackett, et al, 1996
EBM facilitated Teaching

- Recognize Knowledge Gap
- Ask
- Acquire
- Appraise
- Apply
- Evaluate Change in Practice
Ask

- Patient
- Intervention
- Comparison
- Outcome
Acquire

Evidence-Based Decision Making & Clinical Effectiveness Research

**ALERT FOR UAHN/CITRIX USERS (3/21/14)**

**EBM Search Tools**
- General EBM Search
- Emergency Medicine EBM Search
- Medical Imaging EBM Search
- Pediatrics EBM Search
- Surgery/Critical Care EBM Search

**Other EBDM Tools**
- Diagnostic test performance calculator tool
- Glossary: evidence-based medicine terms with instructional videos

Want an overview of evidence-based medicine?
- Watch Evidence-based Medicine: An Oral History and other interview videos by EBM leaders on the JAMA Network

Questions on the above search tools?
- Read about our team
Appraise

• Evidence is NOT created equal
• The quality of the science underlying a piece of evidence largely determines quality
• But other things matter too –
  • Relative benefits and risks
  • Cost
  • Patient Values
  • Inconvenience
Systematic Reviews, high quality RCTs

Observational Studies, prospective

Observational Studies, retrospective

Case series

Textbooks and Expert Opinion without Critical Appraisal
### Levels of Evidence 1

#### Oxford Centre for Evidence based Medicine - Levels of Evidence (March 2009)

What are we to do when the irresistible force of the need to offer clinical advice meets the immovable object of flawed evidence? All we can do is our best give the advice, but alert the advicees to the flaws in the evidence on which it is based.

The CEBM Levels of Evidence 1 document sets out one approach to systematising this process for different question types.

(For definitions of terms used see our glossary)

<table>
<thead>
<tr>
<th>Level</th>
<th>Therapy / Prevention, Aetiology / Harm</th>
<th>Prognosis</th>
<th>Diagnosis</th>
<th>Differential diagnosis / symptom prevalence study</th>
<th>Economic and decision analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>SR (with homogeneity*) of RCTs</td>
<td>SR (with homogeneity*) of inception cohort studies; CDR* validated in different populations</td>
<td>SR (with homogeneity*) of Level 1 diagnostic studies; CDR* with 1b studies from different clinical centres</td>
<td>SR (with homogeneity*) of prospective cohort studies</td>
<td>SR (with homogeneity*) of Level 1 economic studies</td>
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<tr>
<td>1b</td>
<td>Individual RCT (with narrow Confidence interval)*</td>
<td>Individual inception cohort study with &gt; 80% follow-up; CDR* validated in a single population</td>
<td>Validating** cohort study with good*** reference standards, or CDR* tested within one clinical centre</td>
<td>Prospective cohort study with good following****</td>
<td>Analysis based on clinically sensible costs or alternatives; systematic review(s) of the evidence, and including multi-way sensitivity analyses</td>
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<tr>
<td>1c</td>
<td>All or none§</td>
<td>All or none case-series</td>
<td>Absolute Spins and SmNouts****</td>
<td>All or none case-series</td>
<td>Absolute better-value or worse-value analyses****</td>
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<tr>
<td>2a</td>
<td>SR (with homogeneity*)</td>
<td>SR (with homogeneity*) of SR (with homogeneity*)</td>
<td>SR (with homogeneity*) of SR (with homogeneity*)</td>
<td>SR (with homogeneity*) of SR (with homogeneity*)</td>
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Apply

- Clinical decision knowledge gaps
- Teaching
- Research
- Need for Lifelong learning
Teaching
Teaching
Evidence-Based Medicine Training in Undergraduate Medical Education: A Review and Critique of the Literature Published 2006–2011

Lauren A. Maggio, MS(LIS), MA, Nancy H. Tannery, MLS, H. Carrie Chen, MD, MEd, Olle ten Cate, PhD, and Bridget O’Brien, PhD
Lecture Halls without Lectures — A Proposal for Medical Education

Charles G. Prober, M.D., and Chip Heath, Ph.D.
Physician Numeracy as the Basis for an Evidence-Based Medicine Curriculum

Goutham Rao, MD, and Steven L. Kanter, MD

Academic Medicine, Vol. 85, No. 11 / November 2010
### Numeracy concepts

<table>
<thead>
<tr>
<th>Numeracy Concepts</th>
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<tbody>
<tr>
<td>Percentile</td>
<td>Absolute Risk</td>
</tr>
<tr>
<td>Power</td>
<td>Accuracy</td>
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<tr>
<td>Precision</td>
<td>Area under curve</td>
</tr>
<tr>
<td>Predictive Values</td>
<td>Association</td>
</tr>
<tr>
<td>Pre-test and Post-test Probability</td>
<td>Attributable Risk</td>
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<tr>
<td>Prevalence</td>
<td>Coefficient</td>
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<tr>
<td>P-value</td>
<td>Confidence interval</td>
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<tr>
<td>Randomization</td>
<td>Correlation</td>
</tr>
<tr>
<td>Range</td>
<td>Data types</td>
</tr>
<tr>
<td>Regression</td>
<td>Effect size</td>
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<tr>
<td>Relative Risk</td>
<td>Event rate</td>
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<tr>
<td>Reliability</td>
<td>Histogram</td>
</tr>
<tr>
<td>Sample size</td>
<td>Incidence</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Likelihood ratio</td>
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<tr>
<td>Skew</td>
<td>Mean</td>
</tr>
<tr>
<td>Specificity</td>
<td>Median</td>
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<tr>
<td>Standard deviation</td>
<td>Meta-analysis</td>
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<tr>
<td>Statistical significance</td>
<td>NNH</td>
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<tr>
<td>Variance</td>
<td>NNT</td>
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<tr>
<td></td>
<td>Odds ratio</td>
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EBM facilitated Research

• Hierarchy matters!

• Other relevant issues –
  • Pathophysiology is always important
  • Translational potential should be addressed
  • BigData study designs may be difficult to appraise
Saving evidence once you’ve found it

- EndNote libraries!
- Pubmed

  1. Create a new EndNote library and name it
  2. Do the search and choose the citations worth keeping
  3. Go to "Send to" dropdown. Choose "Citation Manager" from that dropdown. Then choose "Create File". Choose "Open" and the file automatically opens in the new EndNote library
Saving searches to EndNote

Nicole Capdarest-Arest, MA (LIS), is the Emerging Technologies Librarian at the Arizona Health Sciences Library. With prior professional experience in medical education and medical information services librarianship, Ms. Capdarest-Arest brings technical and information resources experience and expertise to the ongoing development of the AHSL/COM EBM search engines.
A lifetime of learning

The practice of evidence-based medicine is a process of life-long, self-directed learning in which caring for our own patients creates the need for clinically important information about.....

David Sackett, 1997
Evaluate, please

- Evaluate today’s session
- Re-evaluate how your Teaching, Research and Lifelong learning practice has changed two months from now
About the Presenter

Arizona Health Sciences Library/College of Medicine & Evidence-based Decision Making (EBDM)

- **Sam Keim, MD, MS**, head of the [Department of Emergency Medicine](#) and director of the [Arizona Emergency Medicine Research Center (AEMRC)](#) at the University of Arizona College of Medicine – Tucson, is an expert, published author and leading champion of evidence-based decision making at the Arizona Health Sciences Center.

- In collaboration with Paul Bracke, MLS and David Howse, MLS (both previously with the Arizona Health Sciences Library), Dr. Keim initiated and continues to lead the development of the AHSL/COM [EBM search engines](#) and has published several [peer-reviewed articles](#) on their development.