Intro to Evidence Based Medicine

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Outline

- What is EBM?
- Why do we need it?
- How to use EBM in daily practice
- The five steps
- Formulating an ACQ
Sackett defines Evidence Based Medicine as:

- The conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients

BMJ 1996; 312: 71-72
# EBM Misconceptions

<table>
<thead>
<tr>
<th>FALLACY</th>
<th>FACT</th>
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<tbody>
<tr>
<td>EBM is useless when there is no good evidence</td>
<td>EBM means appropriately using the best available evidence to care for patients</td>
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<tr>
<td>EBM is algorithms that ignore clinical judgment/expertise</td>
<td>Clinical judgment must be used in deciding how to apply the evidence</td>
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<tr>
<td>EBM is just numbers and statistics</td>
<td>EBM is not numbers in a vacuum – the evidence must be individualized to each patient</td>
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EBM - What is it?

Clinical Expertise

Research Evidence

Patient Preferences
Why EBM?

• Caring for patients creates the need for clinically important information
  – Diagnosis….Therapy….Prognosis

• Knowledge deteriorates with time: Practitioners practice what they learned during residency training
  – EBM: goal of life-long self-directed learning

• New evidence often changes clinical practice
WHY EBM?

• Prospective learning from reading journals and going to conferences is important, but not sufficient
  – Impossible to prospectively acquire all information necessary to treat all future patients
Besieged with Information

• More than 3800 biomedical journals in MEDLINE
• More than 7300 citations added weekly
• Lag period
  – Publication of research findings
  – Implementation in clinical practice
• All studies not equally well designed or interpreted
  – Adding expert synthesis and analysis can truly help busy clinicians
EBM Method

Assess your patient

Ask clinical questions

Acquire the best evidence

Appraise the evidence

Apply evidence to patient care
Assess Your Patient

• History
• Physical examination
• Objective data – labs, x-rays

• Formulate differential diagnosis
• Pretest probability of disease
Two types of Clinical Questions

- Background
- Foreground
Asking Questions

Foreground Questions

Background Questions

Novice

Expert
Acquire the Best Evidence

• Where do you find high-quality evidence?
  – Textbook (print or online)
  – Medline or PubMed search: find and review articles
  – Pre-appraised evidence
    • Best Evidence
    • Clinical Evidence (Therapy only)
    • Cochrane Collaboration (Therapy only)
    • UpToDate

• Which source enables you to find answers most quickly?
Appraise the Evidence

• Are the results valid?
• What are the results?
• Can we apply the results to our patient?
Appraise the Evidence

- Determine if evidence is unbiased or flawed
  - Critically appraise articles yourself
  - Use a source that appraises trials for you
    - Best Evidence
    - Clinical Evidence
    - Cochrane Library
    - Up To Date
Apply the Evidence

- Evidence must be applied to each individual patient
  - Is your patient similar enough to those studied?
  - Do benefits outweigh harms?
  - Cost
  - What are your patient’s values and preferences?
Why EBM Should Matter to Clinicians

- Certification/recertification will require physicians to be evaluated on 6 general competencies:
  - Patient Care
  - Medical Knowledge
  - *Practice-Based Learning and Improvement*
  - Interpersonal and Communication Skills
  - Professionalism
  - Systems-Based Practice
The Practice of EBM

The practice of EBM is the integration of

- **Individual clinical expertise**
  - clinical judgment and proficiency gained through experience in clinical practice
  - reflected through improved expertise and efficiency in diagnosis

BMJ 1996; 312: 71-72
WITH THE

• **Best available external clinical evidence from systematic research**

  – research from basic sciences and patient centered clinical research into the accuracy and precision of diagnostic tests (including the clinical examination), the power of prognostic markers, and the efficacy and safety of therapeutic, rehabilitative, and preventive regimens

  – it is important but not sufficient to understand pathophysiologic basis of disease

  BMJ 1996; 312: 71-72
Patient’s values and expectations

- identification and compassionate use of individual patients' predicaments, rights, and preferences in making clinical decisions about their care

- skill involved in application of results of clinical trials to individual patients

BMJ 1996; 312: 71-72
EBM Method

1. **Assess** your patient
2. **Ask** clinical questions
3. **Acquire** the best evidence
4. **Appraise** the evidence
5. **Apply** evidence to patient care

This diagram illustrates the Evidence-Based Medicine (EBM) method, which involves assessing the patient, asking clinical questions, acquiring the best evidence, appraising the evidence, and applying it to patient care.
Formulate a focused clinical question

• P- Patient
• I- Intervention
• C- Comparison
• O- Outcome
• “S”- Study type
Step 1

Decide what type of question is this:

- Is this a general question about well-known information that I don’t know?
- OR is it a very specific question for which the answer may not be easy to find in a textbook?
Two types of Clinical Questions

- Background
- Foreground
Asking Questions

Foreground Questions

Background Questions

Novice

Expert
(Background) Questions

• **Examples:**
  - What causes OA?
  - What drugs are usually used for OA therapy?
  - How to diagnose OA?
  - What are the radiological findings of knee OA?
Background Questions

• General: Basic science of disorder (Pathophysiology), Pharmacology, Anatomy.

• 2-part: Verb + Object
  “what is OA?”
  “how does NSAID work?”
Background questions

- Stable answers ... textbooks
- Asked by learners
(Foreground) Questions

- **Examples:**
  - What’s the best diagnostic test for this patient?
  - What is the best treatment for this patient?
  - Will this treatment help this particular patient live longer or better?
Foreground Questions

- **Specific** (Therapy, Diagnosis, Prognosis ..)

- **4 parts:** asked by clinicians or patients
Step 2

- For Specific (complex) questions
- Convert this question into one that can be answered using the PICO format

- **P** Patient or Population/Problem
- **I** Intervention (therapy or test)
- **C** Comparison (other therapy, test)
- **O** Outcome of interest
- **“S”** “Study”
Foreground Questions

• Patient Centered
  POEM: Clinically important outcomes

• Evolving / Changing Answers
  Need ‘up to date’ research data
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<th>POEM’s</th>
<th>vs.</th>
<th>DOE’s</th>
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<tr>
<td><strong>P</strong></td>
<td>Patient</td>
<td><strong>D</strong></td>
</tr>
<tr>
<td><strong>O</strong></td>
<td>Oriented</td>
<td><strong>O</strong></td>
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<tr>
<td><strong>E</strong></td>
<td>Evidence</td>
<td><strong>E</strong></td>
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*that*
## POEM’s vs. DOE’s

<table>
<thead>
<tr>
<th>Example</th>
<th>Disease-Oriented Evidence</th>
<th>Patient-Oriented Evidence that Matters</th>
<th>Comment</th>
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<tr>
<td>Antiarrhythmic Therapy</td>
<td>Drug X ↓ PVCs on ECG</td>
<td>Drug X increases mortality</td>
<td>POEM study contradicts DOE study</td>
</tr>
<tr>
<td>Antihypertensive therapy</td>
<td>Antihypertensive therapy ↓ BP</td>
<td>Antihypertensive therapy ↓ mortality</td>
<td>POEM agrees with DOE</td>
</tr>
<tr>
<td>Prostate Screening</td>
<td>PSA screening detects prostate cancer early</td>
<td>? whether PSA screening ↓ mortality</td>
<td>DOE exists, but the important POEM is unknown</td>
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*POEM’s vs. DOE’s*
Clinical Scenario:

You are a family physician in a private hospital treating a 75 YO female patient with OA of the right knee. She states she has seen several advertisements on TV reporting that glucosamine is an effective intervention in OA. She asks if glucosamine actually decreases both the progression of OA and its associated pain.
Elderly lady with knee OA?

Intervention/Exposure: Glucosamine

Comparison: NSAID

Outcome: Reduce progression of joint destruction and pain
Answerable Clinical Question (ACQ)

- Well-formulated ACQ will save time:
  - Search for evidence will be efficient
  - Search will be focused to the problem at hand, rather than chaotic

First step in applying results of clinical research to patient care
4 Parts of ACQ (PICO)

- **P** - Patient and problem
- **I** - Intervention (treatment, test, prognostic factor, etiology, etc.)
- **C** - Comparison (if necessary)
- **O** - Outcome
4 Domains of EBM

- Treatment
- Diagnosis
- Prognosis
- Causation/Etiology
Ask Clinical Questions

Components of Clinical Questions

Patient/Population

Intervention/Exposure

Comparison

Outcome

In patients with acute MI

In women with suspected coronary disease

In post-menopausal women

does early treatment with a statin

what is the accuracy of exercise ECHO

does hormone replacement therapy

compared to placebo

compared to exercise ECG

compared to no HRT

decrease cardiovascular mortality?

for diagnosing significant CAD?

increase the risk of breast cancer?
Develop ACQ’s for this case
(treatment, diagnosis, prognosis, cause)

• CC: 18 mo male with ear pain
• HPI:
  – fussy, not eating or sleeping well for the past 2 days
  – One prior OM ~6mo ago
  – Attends daycare, father smokes ½ pack.
• Meds – none
• PE:
  – T – 38.2
  – Left ear TM is red, bulging, with decreased mobility
  – Few small anterior lymph nodes
  – Rest of the exam is normal
Treatment

• **P** - Among young children with Otitis Media,

• **I** - does treatment with Amoxicillin

• **C** - compared with placebo

• **O** - result in a more rapid improvement, less pain and fever free?
Diagnosis

• **P** - Among young children with ear pain,

• **I** - how does the clinical exam

• **C** - compare to tympanocentesis

• **O** - in diagnosing Otitis Media?
Prognosis

- **P** - Among young children with Otitis Media,

- **I** - is household smoking an important prognostic factor

- **C** -

- **O** - in predicting frequency of the disease?
Etiology/Harm

- **P** - controlling for confounding factors, do otherwise healthy children

- **I** - who attend daycare,

- **C** - compared to children who do not

- **O** - have increased incidence of Otitis Media in the first two years of life?
ACQ anyone?

• My child had 5 seizures. It only happens when he gets a high fever. Should he be getting seizure medicine?
Treatment

- P - In a child with frequent febrile seizures
- I - would anticonvulsant therapy
- C - compared to no treatment
- O - result in seizure reduction?
ACQ someone else?

- My 7 year old son has sore throat, Doctor do you think it is a strept throat?
Diagnosis

P - In an otherwise healthy 7-year-old boy with sore throat,

I - how does the clinical exam

C - compare to throat culture

O - in diagnosing GAS infection?
ACQ this one too

- My daughter has Down’s syndrome, but she is doing much better than other Down’s syndrome kids in her special ed school. Do you think that she will be protected from Alzheimer’s?
Prognosis

- **P** - In children with Down syndrome,
- **I** - is IQ an important prognostic factor
- **C** -
- **O** - in predicting Alzheimer’s later in life?
I’m a teacher in primary school. I have twins in my class and they have problems with learning. Could it be that they were exposed to drugs during their pregnancy?
Etiology/Harm

- **P** - controlling for confounding factors, do otherwise healthy children
- **I** - exposed in utero to cocaine,
- **C** - compared to children not exposed
- **O** - have increased incidence of learning disabilities at age six years?
Good ACQ?

- Does Amoxicillin work better for otitis media than placebo in children who are in daycare?
Good ACQ?

- Is Amoxicillin an effective treatment for children with otitis media?
Good ACQ?

- Does the treatment with antibiotics result in more rapid improvement of otitis media than no treatment?
Good ACQ?

• Among young children with otitis media, does treatment with Amoxicillin result in more rapid improvement than placebo?
Good ACQ?

- Is there something more effective than Albuterol in reducing length of hospital stay in children with asthma?
In children with acute asthma, does the addition of Atrovent to standard therapy with Albuterol decrease the rate of hospitalization?
Develop ACQ’s for these cases.

- 27 wks preemie, with small PDA, Treatment?
Another case

- 2 months old former 25 wks preterm on nasal canula 30% O2, would you use steroids?
5 days old with severe birth asphyxia on vent, parents ask for when can he go home?
Another one

• Would you measure CRP serum level in preterm newborns to decide if they have sepsis?
• 36 months old infant former 26 wk preterm, has developmental delay and features of CP. Parents ask you if this is because of grade III IVH that he had?
Thank You
Appraise the Evidence

“Fun With Numbers”

• Remember the important statistical values:
  - Relative Risk Reduction
  - Absolute Risk Reduction
  - Number Needed to Treat (NNT)
  - Sensitivity and Specificity
  - Positive and Negative Predictive Values
  - Likelihood Odds Ratios
Evaluate your performance

• Self evaluation is key to successfully practicing EBM
  - Am I asking answerable clinical questions?
  - Am I searching the literature?
  - Are you becoming more efficient in your searches?
  - Are you integrating your critical appraisals into your practice at all?
Evidence Pyramid

- Meta-Analysis
- Systematic Review
  - Randomized Controlled Trial
    - Cohort studies
    - Case Control studies
    - Case Series/Case Reports
    - Animal research
Levels of Evidence

- **Level 1**: Randomized Clinical Trials
- **Level 2**: Head to Head Trial or Systematic Review of Cohort Studies
- **Level 3**: Case-Control Studies
- **Level 4**: Case-series
- **Level 5**: Expert Opinion
Are the results of this study **valid**?

1. Were patients randomized to treatment?
2. Were patients & clinicians and others blinded?
3. Was follow-up long and complete, were pts analysed in the group that they were assigned to (Intention to treat)?
4. Were groups treated equally?
5. Were the groups similar at the start?
1. **Was the assignment of patients to treatment randomized? And was the randomization list concealed?**

   - Why random allocation?
   - Why concealed from the clinicians?
   - How the study was randomized?
2. Was follow-up long & complete?

- If all patients who were entered into the trial were accounted for at its conclusion
- Follow up: *long enough*....
- Were all patients analyzed in the groups to which they were randomized?
  - All patients (even those who fail to take their medicine or accidentally or intentionally receive the wrong treatment)
  - Cross-over design
  - Intention-to-treat analysis
Are the results of this study *valid*?

1. Were patients randomized to treatment?
2. Was follow-up long and complete?
3. Were patients & clinicians blinded?
4. Were groups treated equally?
5. Were the groups similar at the start?
4. Were Patients And Clinicians Kept Blind To Treatment?

- Investigator
- Care taker
Are the results of this study valid?

1. Were patients randomized to treatment?
2. Was follow-up long and complete?
3. Were patients & clinicians blinded?
4. Were groups treated equally?
5. Were the groups similar at the start?
4. Apart from The Experimental Therapy, Were Groups Treated Equally?

- Double or more, blind
- Why?
- To prevent co-interventions
Are the results of this study **valid**?

1. Were patients randomized to treatment?
2. Was follow-up long and complete?
3. Were patients & clinicians blinded?
4. Were groups treated equally?
5. Were the groups similar at the start?
Are The Valid Results Of This Individual Study Important?

1. What is the magnitude of the treatment effect?
2. How precise is this estimate of the treatment effect?
P value

- Null hypothesis
- If <0.05 the results are not due to chance
- Does not tell about magnitude or precision
Therapy

- ARR or RD
- RRR
- RR
- NNT
- OR
- C.I.
Is this study applicable to our patient?

1. Is our patient so different from those in the study?
2. Is the treatment feasible?
3. What are our patient’s potential benefits and harms from the therapy?
4. What are our patient’s values and expectations?
Hands-On Experience