Interpreting the Medical Literature

Applying EBM in Practice

Updated August 2022

"It's not how much you know, it's how fast you can find the answer."

Use buttons to navigate

What is?

Why?

How to?

Background vs. Foreground

PICO

DOE vs. POEM

Validity and Relevance

SORT

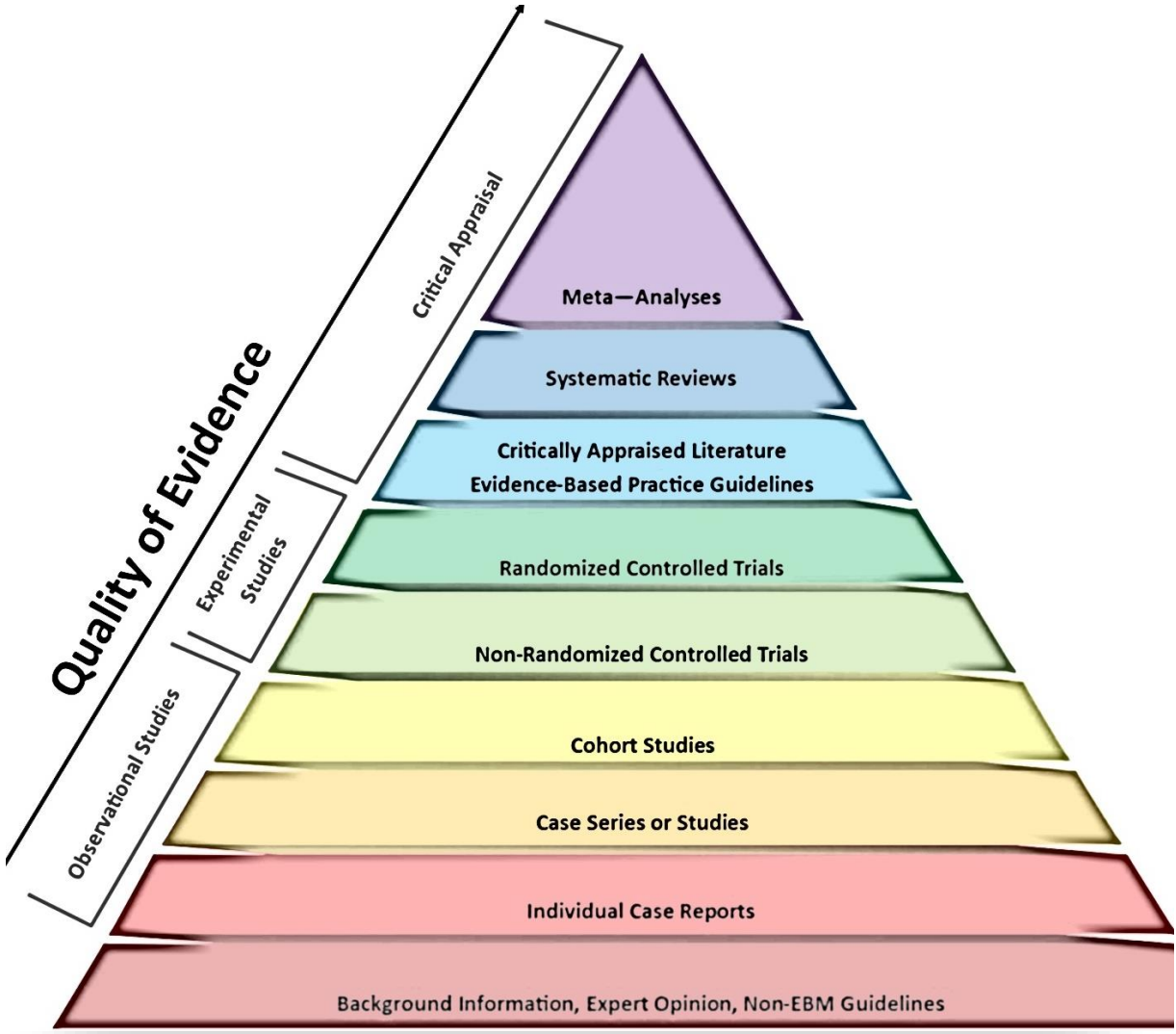
EBM Stats 101

Guidelines

Additional reading

What is…?

- EBM
- Practice of EBM
- PICO
- DOE
- POEM



Why?

- Physicians and time: As we are in practice longer…
  - Clinical Skills: Improve or worsen?
  - Medical knowledge: Increases or decreases?

- In an average day of patient care, how many clinical questions are generated?
  - Of these, how many do we get answers for?

How to?

Fishing

- To answer a specific question

Foraging

- To keep up with new developments

Background vs. Foreground

- **Background questions**: General knowledge about a condition or thing
- **Foreground questions**: Specific knowledge to inform clinical decisions or actions

- Are the following examples of background or foreground information and questions?
  - Textbooks
  - Randomized control trial
  - What are the clinical manifestations of menopause?
  - In patients with vasomotor symptoms of menopause, how effective is paroxetine compared to HRT in achieving improved quality of life from hot flashes?
  - What causes migraines?
  - Review articles
  - In patients with subclinical hypothyroidism, does treatment with thyroid hormone replacement compared to observation decrease morbidity (QoL) or mortality?

PICO

- **P** Describe patients similar to yours, balance precision with brevity
- **I** Be specific. Cause, test, prognostic factor, treatment.
- **C** If necessary
- **O** Be specific

DOE vs. POEM

Which is it?

- Lab values
- Side-effects
- Convenience
- Test results
- Metabolic pathway
- Symptoms
- Physical exam findings
- Cost
- Epidemiology
- Mortality

Validity and Relevance

What is validity?

What characteristics help determine relevance of the evidence?

SORT

- What does SORT stand for?

- What is SORT A?
- What is SORT B?
- What is SORT C?

EBM Stats 101

Define the following:

- Sensitivity*
- Specificity*
- Positive likelihood ratio
- Negative likelihood ratio
- Number needed to treat
- Number needed to harm

Guidelines We Can Trust

- Who makes guidelines?
- What are common flaws of guidelines?
- According to the Institute of Medicine (IOM) what are the 8 standards that should be present for trustworthy guidelines?
- What key action statements do you look for when evaluating guidelines?

Definitions

EBM	• "The conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients."
Evidence-based practice	• The integration of individual clinical expertise + best available external clinical evidence + patient's values and expectations
PICO	• Patient/Population, intervention, comparison, outcome
DOE	• Disease-oriented evidence
POEM	• Patient-oriented evidence that matters

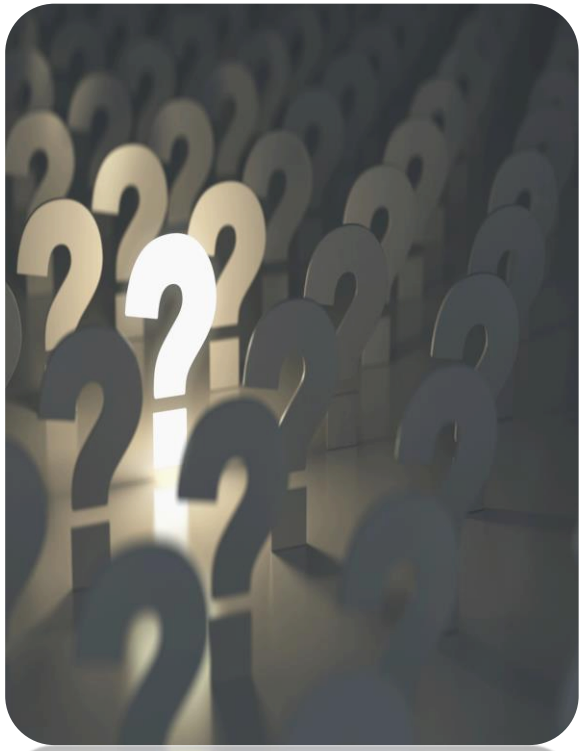
Why?

With time…

- Clinical skills **IMPROVE**: clinical diagnosis, patient interaction, clinical judgment
- Medical knowledge **DECLINES**: Recent graduates use more tests and treatments supported by evidence

Each day of 25 patients seen, we generate:

- About **15** clinical questions
- We get answers for less than 1/3 of these



How to?

Fishing

- Essential Evidence Plus
- DynaMed
- UpToDate (?)
- Cochrane Collaboration
- USPSTF/WHO/MOH Guidelines
- National Guideline Clearinghouse

Foraging

- *Evidence-Based Medicine*
- *Journal of Family Practice* POEMs
- *American Family Physician* (SORT, etc.)
- ACP Journal Club
- STAT!Ref Evidence Alerts

Background

- Textbooks
- Review articles
- What causes migraines?
- What are the clinical manifestations of menopause?

Foreground

- Randomized control trials
- In patients with subclinical hypothyroidism, does treatment with thyroid hormone replacement compared to observation decrease morbidity (QoL) or mortality?
- In patients with vasomotor symptoms of menopause, how effective is paroxetine compared to HRT in achieving improved QoL from hot flashes?

PICO: Practice

	P	I	C	O
Diabetes				
Aspirin use				
Osteoporosis				
Daily multivitamin				

PICO: Practice

	P	I	C	O
Diabetes	Adults with type 2 DM	Treatment with metformin	Treatment with sulfonylurea	Decrease all-cause mortality?
Aspirin use	Adults 40-59yo with HTN but no CAD	Daily aspirin use	No daily aspirin	Decrease cardiovascular mortality?
Osteoporosis	Postmenopausal women without a prior fracture	HRT	No treatment	Reduce fracture incidence?
Daily multivitamin	Non-pregnant adults	Daily multivitamin	Dietary nutrients without vitamin supplementation	Prevent cardiovascular disease or cancer?

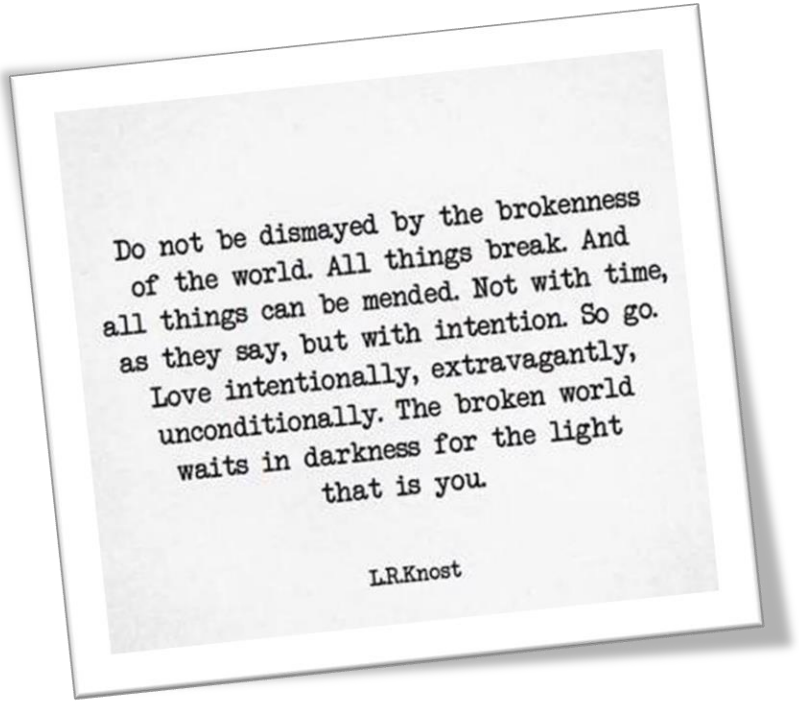
DOE vs. POEM

DOE

- Lab results
- Test results
- PE Findings
- Metabolic pathway
- Epidemiology

POEM

- Symptoms
- Side effects
- Convenience
- Cost
- Mortality



DOE vs. POEM: Practice

	DOE	POEM
BP medication (Doxazosin)		
Cholesterol medication (fibrate)		
Anti-glycemic medication (sulfonylurea)		
Annual Physical Exam		
Treating subclinical hypothyroidism		
Daily multivitamin		

DOE vs. POEM: Practice

	DOE	POEM
BP medication (Doxazosin)	Decreases SBP by 11 points	Increases mortality
Cholesterol medication (fibrate)	Improves lipid panel	No benefit on CV mortality
Anti-glycemic medication (sulfonylurea)	Decreases A1c by 1-3 points	Increases CV mortality
Annual Physical Exam	Increases diagnoses in the chart	Does not affect M&M
Treating subclinical hypothyroidism	Increases heart ejection fraction	No symptom improvement
Daily multivitamin	Increases serum levels	Does not affect CV events/mortality, cancer mortality, or all-cause mortality

Validity and Relevance

Validity

- Is it factually sound?
- What is the methodology of the study?

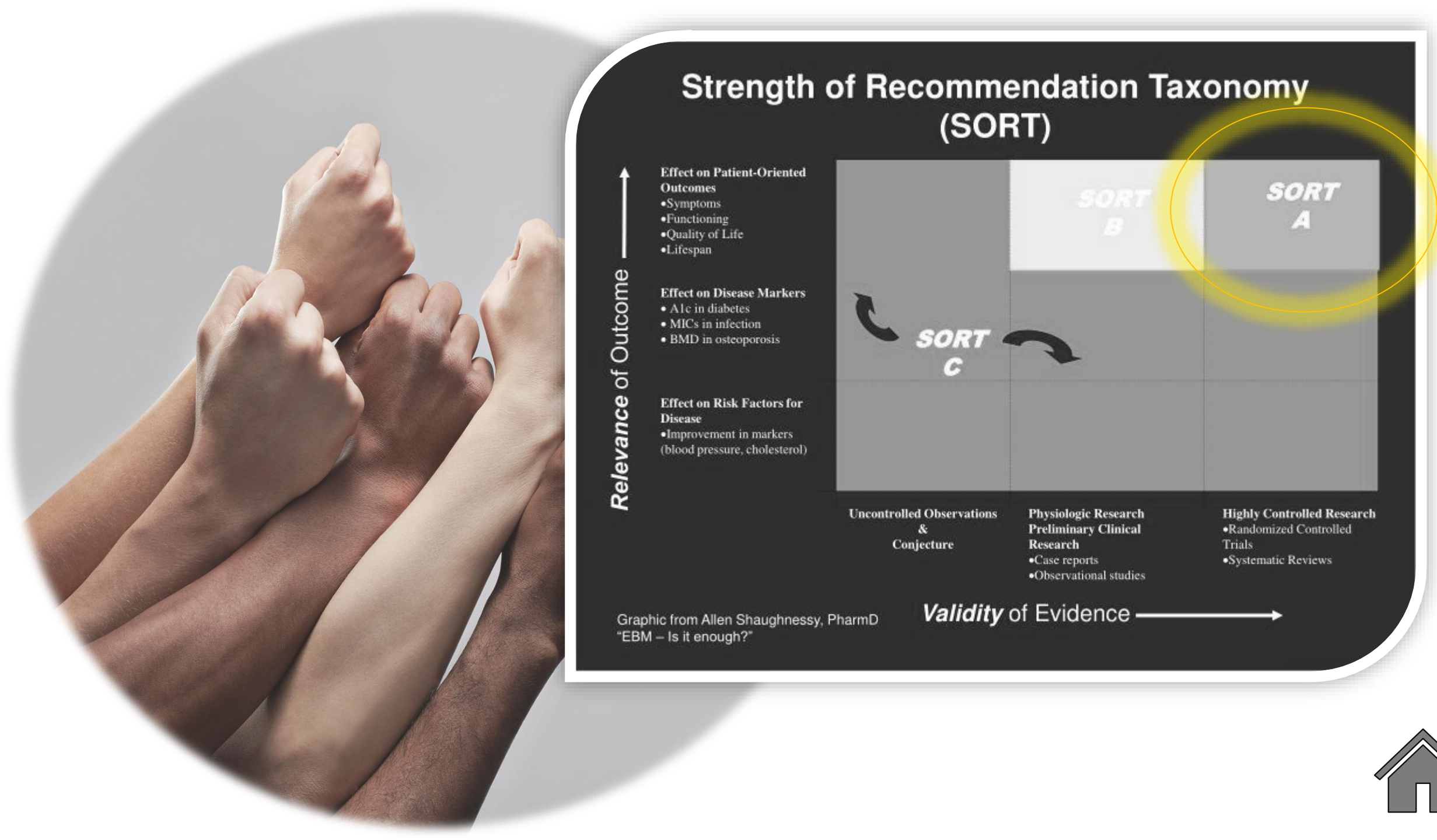
Relevance

- Is it potentially useful to you as a clinician?
- Is it a POEM?
- Is the population similar?
- Is it practice-changing?

Graphic from Allen Shaughnessy, PharmD
"EBM – Is it enough?"

Strength of Recommendation Taxonomy

- **A** — Consistent and good quality patient-oriented evidence
- **B** — Inconsistent or limited quality patient-oriented evidence
- **C** — Consensus guidelines, usual practice, opinion, disease-oriented evidence, case series


Strength of Recommendation Taxonomy (SORT)
Relevance of Outcome
Effect on Patient-Oriented Outcomes
•Symptoms
•Functioning
•Quality of Life
•Lifespan
Effect on Disease Markers
• A1c in diabetes
• MICs in infection
• BMD in osteoporosis
Effect on Risk Factors for Disease
•Improvement in markers (blood pressure, cholesterol)
SORT B
SORT A
SORT C
Uncontrolled Observations & Conjecture
Physiologic Research Preliminary Clinical Research
•Case reports
•Observational studies
Highly Controlled Research
•Randomized Controlled Trials
•Systematic Reviews
Validity of Evidence
Graphic from Allen Shaughnessy, PharmD
"EBM – Is it enough?"

EBM Stats 101

Specificity
(Patients without disease)

- **SPin rules IN** (High SP = easier to rule in)
- True negative rate – the percentage of patients without a disease who test negative.

Sensitivity
(Patients with disease)

- **SNout rules OUT** (High SN = easier to rule out)
- True positive rate – the percentage of patients who have a disease who test positive

Positive LR

- How much more likely it is for a patient with a positive test result to actually have the disease
- Sensitivity / (1-Specificity)
- ***What value is considered an excellent test?***

Negative LR

- How much less likely is it for a patient with a negative test result to actually have the disease?
- (1-Sensitivity) / Specificity
- ***What value is considered an excellent test?***

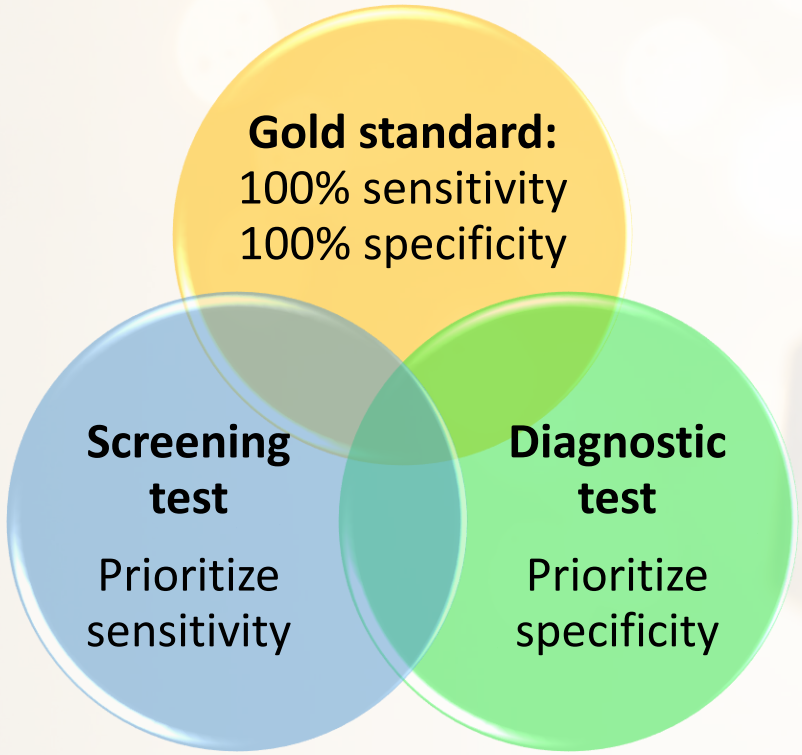
NNT

- The number of patients that must be treated to prevent one bad outcome
- NNT = 1/ARR

NNH

- The number of patients that must be treated for one additional patient to experience a bad outcome
- NNH = 1/ARI

Sensitivity vs. Specificity



How good is that physical exam?

Exam	Sensitivity	Specificity
Murphy sign		
Kernig or Brudzinski sign		
Psoas sign		
Anterior drawer test		
Lachman test		
McMurray test		
Thessaly test		

How good is that physical exam?

Exam	Sensitivity	Specificity
Murphy sign	48-97%	48-98%
Kernig or Brudzinski sign	9-18%	93-96%
Psoas sign	13-42%	79-97%
Anterior drawer test	27-88%	91-99%
Lachman test	48-96%	90-99%
McMurray test	17-52%	77-98%
Thessaly test	92%	96%

How good is that test?

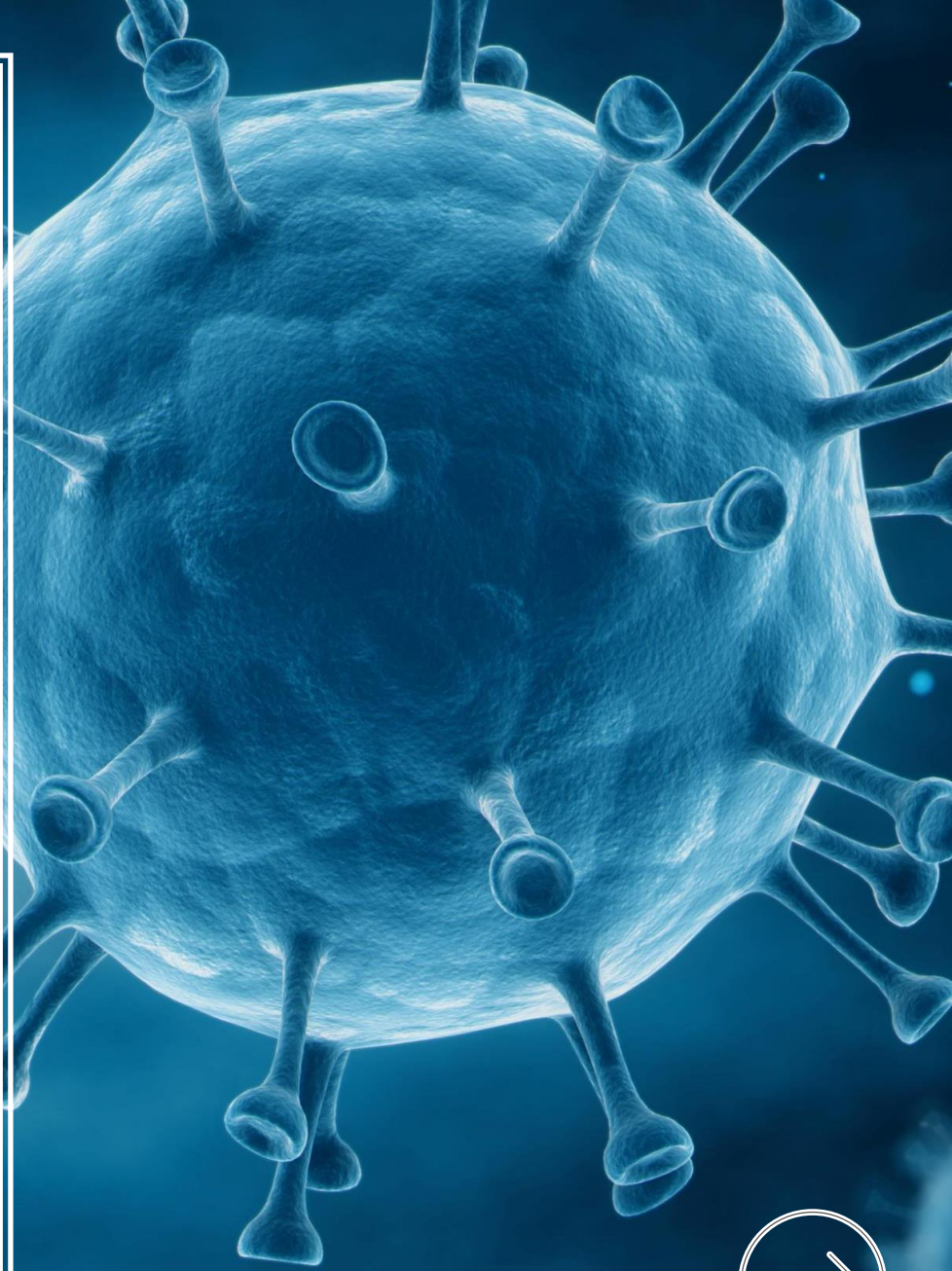
Test	Sensitivity	Specificity
Detection of CIN2+		
Pap + HPV testing		
Pap smear alone		
HPV alone		
Diagnosis of Pulmonary TB		
CD4 count > 200		
CD4 count ≤ 200		
CD4 count > 100		
CD4 count ≤ 100		

How good is that test?

Test	Sensitivity	Specificity
Detection of CIN2+		
Pap + HPV testing	100%	92.5%
Pap smear alone	54%	96.8%
HPV alone	94.6%	94.1%
Urine LF-LAM for TB diagnosis in HIV+ Patients Based on CD4 Count		
CD4 count > 200	15%	96%
CD4 count ≤ 200	49%	90%
CD4 count > 100	26%	92%
CD4 count ≤ 100	56%	90%

Detection of Bacteremia in Febrile Patients

- Rank the following for how useful they are in determining whether a febrile patient has bacteremia (likelihood ratio of each):
  - Leukocytosis: WBC > 15,000
  - Band count > 1,500
  - Temperature > 38.5C
  - Renal failure
  - Hospitalization for trauma
  - Indwelling urinary catheter
  - Previous stroke
  - Diabetes
  - Poor functional performance
  - Age 50 year or more



Detection of Bacteremia in Febrile Patients

Finding	Likelihood Ratio
Renal failure	4.6
Poor functional performance	3.6
Hospitalization for trauma	3.0
Previous stroke	2.8
Band count > 1500	2.6
Indwelling urinary catheter	2.4
Hypotension	2.2
Diabetes	1.6
Leukocytosis > 15K	1.6
Age > 50yo	1.4
Temperature > 38.5C	1.2

Guidelines: Who Makes Them

- Government-sponsored or organized
- Physician specialty societies
- Disease-specific organizations
- *Which of these would you be most likely to trust?*

Guidelines: Common Flaws

- Conflict of interest
- Too many and/or poorly articulated recommendations
- Based entirely on expert opinion and/or low-level evidence
  - "A group of experts expressing their views is not evidence." (Am Fam Phys 2012)
  - "Strong recommendation based on low level evidence" (ACC/AHA)
- Not useful for generalists and real-world patients
- Don't appropriately weigh harms and benefits

Trustworthy Guidelines: IOM Standards

- Transparency
- Management of conflict of interest
- Group composition
- Guideline intersection with systematic review
- Establish evidence foundation for and rating strength of recommendations
- Articulation of recommendations
- External review
- Updating

Guidelines: Key Action Statements

Who	• Specifically
What	• Precisely what actions
When	• Under what specific conditions
Must/should may	• Level of obligation

To trust or not to trust?

World Health Organization	International Menopause Society	Republic of Zambia Ministry of Health
American College of Cardiology/American Heart Association (ACC/AHA)	United States Preventative Services Task Force (USPSTF)	Society for Cardiovascular Angiography and Interventions
American Academy of Clinical Endocrinology (AACE)	CDC	Choosing Wisely

Additional reading

- Introduction and Chapters 1 and 2 (pages 1-65) of Straus, et al *Evidence-Based Medicine: How to practice and teach EMB.*
- "Are doctors just playing hunches?"
- Becoming a medical information master: Feeling good about not knowing everything
- A guidebook to the medical information jungle
- Teaching evidence-based medicine: Should we be teaching information management instead?
- Keeping up with the medical literature: How to set up a system
- Evaluating and understanding articles about treatment
- Communicating evidence for participatory decision making