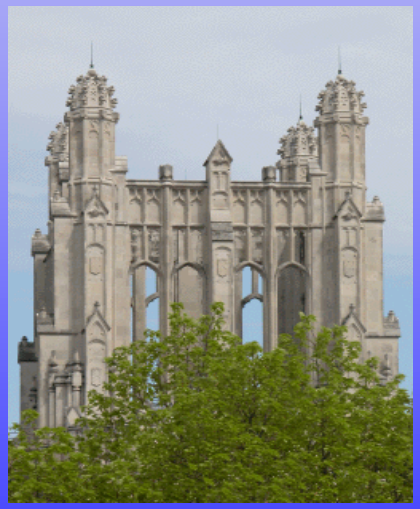
Demystifying Core Issues in Clinical Diagnosis



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How to Teach EBCP June 8, 2017

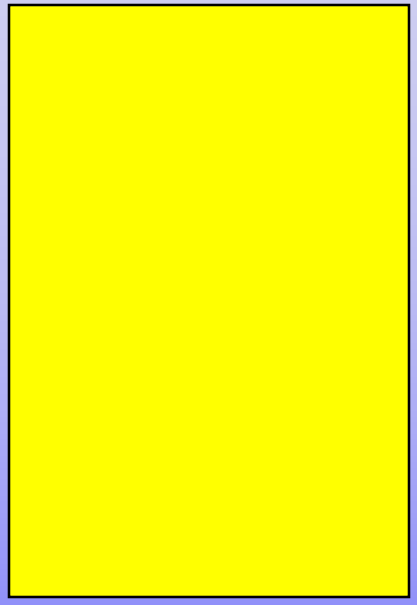
Raygun

Unpaid Advertisement

Disclosures

- I have no financial or non-financial conflicts of interest
- However, I do sport a southwestern drawl honed in West Texas …
- And my passion over past 25+yrs is to create learning opportunities for resident/fellow physicians so they can be <u>better</u> than their faculty

Please Label Your Card Now



Yellow Card

- **Side #1 = ‘Handout’ (for insights & tactics)**

Mr. Cox – 80y/o

- **Exasperated daughter brought to ED because "he hurts all over and can't hardly move"**
- **Doctors & PT not helping with his C3-4 spinal stenosis (mod to severe) or known bilat rotator cuff disease**
- Hgb 11; Na 126; LFTs nl except Alb 2.2
- ESR = 120
- RF = 774 IU/ml
- ED also got Anti-CCP = 300U/ml (nl <3)

Mr. Cox – 80y/o

- New Rheum Fellow called by ED …

  “Sounds like he’s got RA; we’ll see him in consult”

- **Admitting Dx Overnite: RA, deconditioning, needs NHP**

- **At 7:30am:** Diffuse aches, especially in shoulders and some hips; Fell on ice in March & broke left humerus; managed with immobilization; Ever since declining, especially past 2months

- Retired machinist for John Deere; Lives alone; HTN; DM; No h/o periodic joint swelling

Mr. Cox – 80y/o

- **40# wt loss over winter; daughter wonders if "cause he can't barely feed himself"**
- Looks pitiful, thin with temporal wasting
- Difficulty raising hands out of lap; hurts to gently shake hands; some thenar wasting; Dupuytren contracture
- Moderate tenderness across shoulder muscles; but NT with gentle passive ROM; no effusions or warmth
- **No other joint warmth, swelling, or chronic changes of RA; DTRs 2+**
- **We started therapeutic trial 15mg pred/d;** CXR; & requested outside cervical MRI

Mr. Cox – 80y/o

How are you feeling about his care?

- **Rheum team evaluated:** feels all from spinal stenosis, rotator cuff dz, fracture, immobility. Agrees no synovitis, **but "worried about the high Anti-CCP so consider starting hydroxychloroquine". "Get hand films to find erosions,** do PT, and NHP. **Doubt PMR."**

Today's Road Map Objectives

- Review & Consider Facets of Diagnosis
- Practice Manipulating Numbers
- Practice Manipulating English
- Practice ***Avoiding*** Formulas
- Enjoy Fun Interaction

Key Take Home Messages

1. Ddx should be a verb
2. Orient 2x2 box; Know Doc's perspective
3. For Sen/Spec/PPV/NPV …
   name *denominator first*
4. LRs are the Doctor's friend
5. LR are just a ratio of likelihoods

Framing
Differential Diagnosis & the Process of Diagnosis

What have your experiences been like with differential diagnosis?

Is ‘Differential Diagnosis’ used as

a) A Noun?

or

b) A Verb?

We've Seen That …

The Best Way to Understand Just About Anything in Medicine is to Reflect on a Patient . . .

Additionally,

We Can Learn A Lot from Other Real Life Dilemmas

My Car Won’t Start

WHY???

I Call Mechanic #1

“Oh boy, it could be a lot of things”

- No gas / Too much gas / Bad gas / Blocked gas
- Blocked air intake
- Dead battery / Disconnected battery
- Shorted ignition system / Failed spark plugs
- Ungrounded starter / Cellanoid / Other electrical short

“I’ll send over a tow truck, and we’ll run a bunch of tests to figure it out”

I Call Mechanic #2

#2: “When you turn the key, does it crank or not make any noise?”

Me: “Why do you ask?”

#2: “If it cranks, it’s a fuel or air problem, and if it doesn’t it’s an electrical problem”

I Call Mechanic #3

#3: “Did you run out of gas again?”

Me: “Uhh … I didn’t look at the gas gauge; let me go check …”

“Yep, it’s on empty”

#3: “I’ll be right over with a gallon of gas”

Me: “Please don’t tell my wife”

Why Such Different Responses?

- **Mechanic #1** **(just starting out)**
- **Mechanic #2** **(mid-career & smart)**
- **Mechanic #3** **(old, crusty, & savvy)**

Primary Modes of Diagnostic Problem Solving

1. **Strategy of Exhaustion**
   (Diagnosis by Possibility – Mechanic #1)

2. **Hypothetico-Deductive Strategy**
   (Diagnosis by Probability – Mechanic #2)

3. **Heuristics / Cognitive Shortcuts**
   (Diagnosis by Pattern Recognition – Mechanic #3)

Intersection of Diagnosis & Therapy

So, Ddx can be an ACTIVE VERB

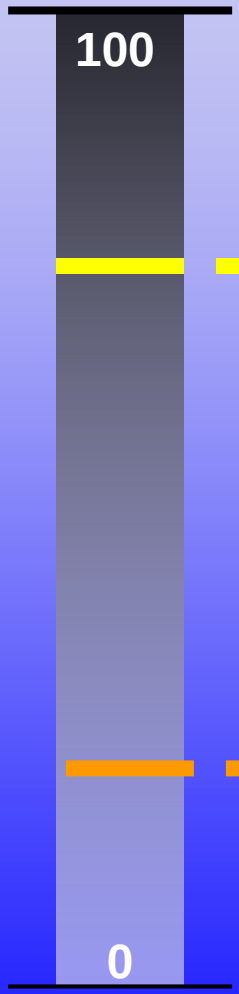
Instead of aiming to simply memorize lists of possibilities …

<u>Regard the Possibilities by</u>:

- **probabilistic implications**
- **prognostic implications**
- **pragmatic implications**

Clinical Action Thresholds

(Critical to Clinicians)



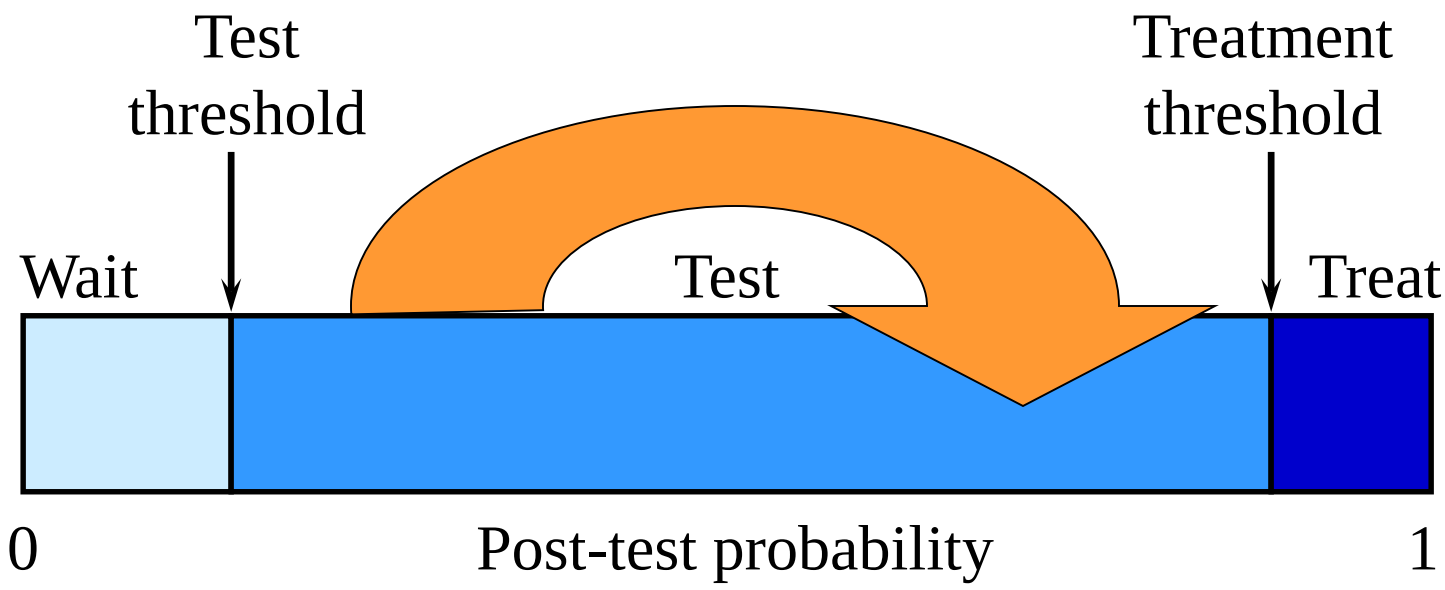
Treatment Threshold

Working Diagnosis &
Few Active Alternatives

Testing Threshold

Other Diagnoses &
Those Ruled Out

Cross a Threshold?



Diagnostic tests most useful when results push disease probability across one of the thresholds, leading to a specific action:

wait… test further… or treat

Where Does Pretest Probability Come From?

Clinical Experience

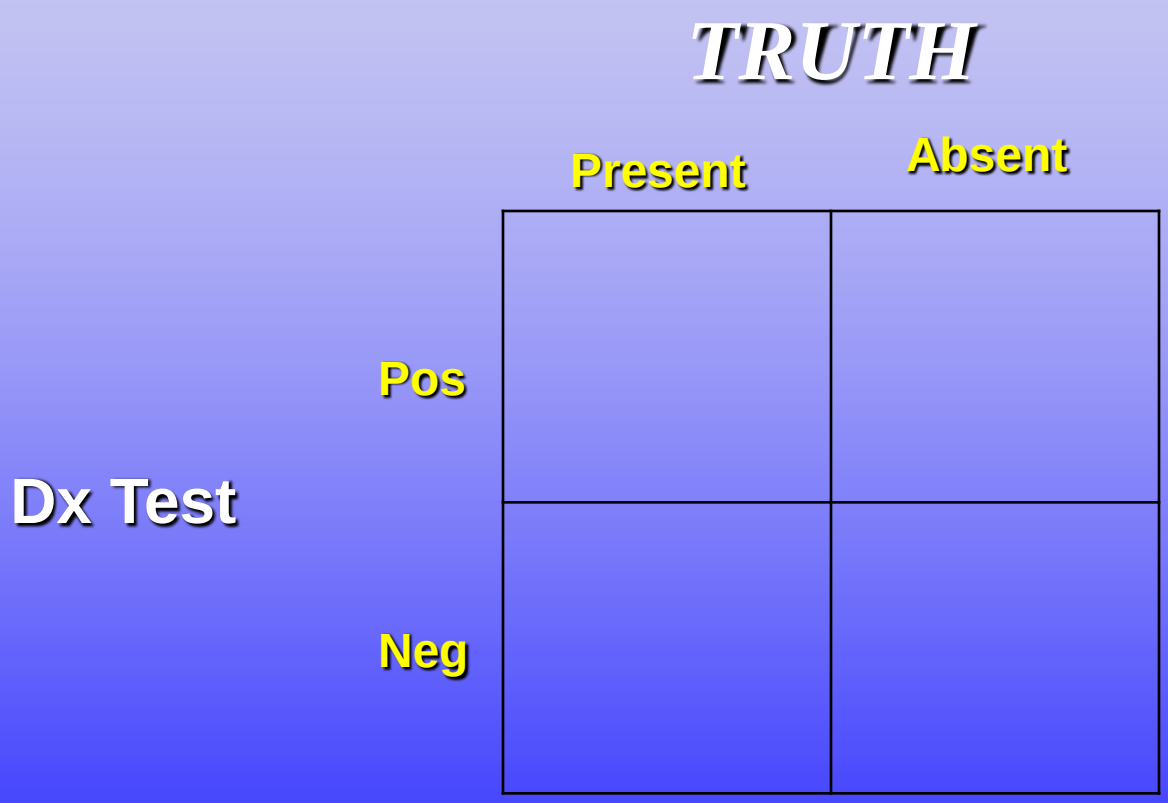
Population Prevalence

Local Practice Databases

Planned Research

- **of P(Dz) for Ddx**
- **of Diagnostic Tests**
- **Clinical Prediction Rules**

The 2 X 2 Table



From what perspective do Docs get to gaze into this box?

The 2 X 2 Table

Neurohormone SAD levels in 200 dazed Cleveland Cavalier fans this morning

SAD Level	Depression: Present	Depression: Absent
>150	50	5
≤150	40	105

What will reassure us that we can trust the results?

The 2 X 2 Table

Neurohormone SAD levels in 200 dazed Cleveland Cavalier fans this morning

SAD Level	Depression: Present	Depression: Absent	
>150	50	5	PPV = 50/55 91%
≤150	40	105	NPV =
	Sen = 50/90=56%	Spec = 105/110=95%	

The 2 X 3 Table

Neurohormone SAD levels in 200 dazed Cleveland Cavalier fans this morning

SAD Level	*Depression* Present	Absent
>150	50	5
100-150	25	20
<100	15	85

We Need a 2nd Generation Diagnostic Test Performance Measure …

The Noble Likelihood Ratio

Chief Resident Cohorts

APDIM EBM Workshops

	2003	2007	2015
Sample Size	119	174	107
4th Yr Chief	87%	85%	89%
Univ-Based	56%	56%	56%
Female	50%	47%	43%
Subspecialty Plans	67%	75%	67%

Confident to Explain Concepts

	2003 (n=119)	2007 (n=174)	2015 (n=107)
Likelihood Ratio	23%	23%	34%
Relative Risk Reduction	30%	35%	47%
Absolute Risk Reduction	33%	36%	50%
Confidence Interval	41%	49%	68%
Pretest Probability	46%	46%	63%
Number Needed to Treat	49%	51%	58%

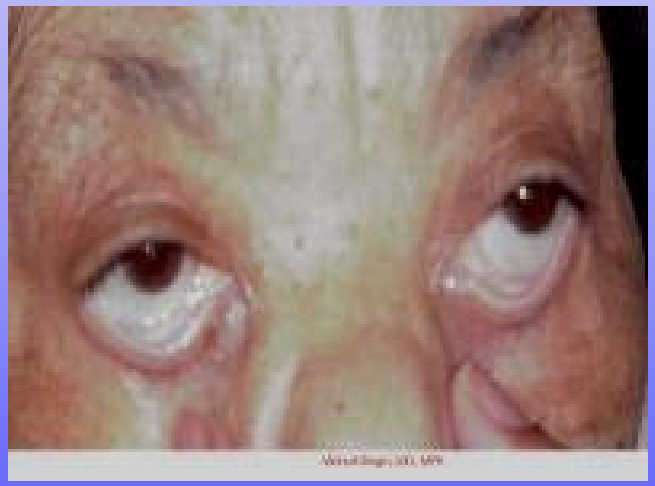
2nd Generation Measure … LR

(No Formulas; just these 2 tenets)

1. **LRs are the *Doctor's Friend***
2. **LRs are just a *Ratio of Likelihoods***

You’re Cranking Out Notes on the Wards …

A Tired Lady:



- 71F, ↑fatigue, ↓exercise tolerance
- Pale conjunctivae
- Cough, sput, fever
- RLL crackles
- Hgb 8.7 g/dL
- Does she have iron deficiency anemia?

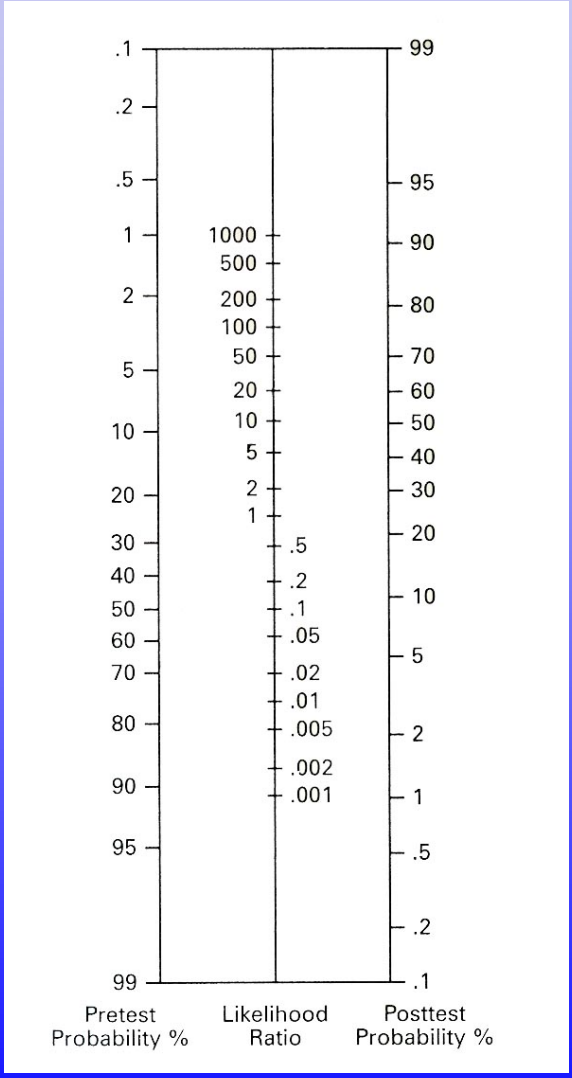
The 2 X 3 Table

Neurohormone SAD levels in 200 dazed Cleveland Cavalier fans this morning

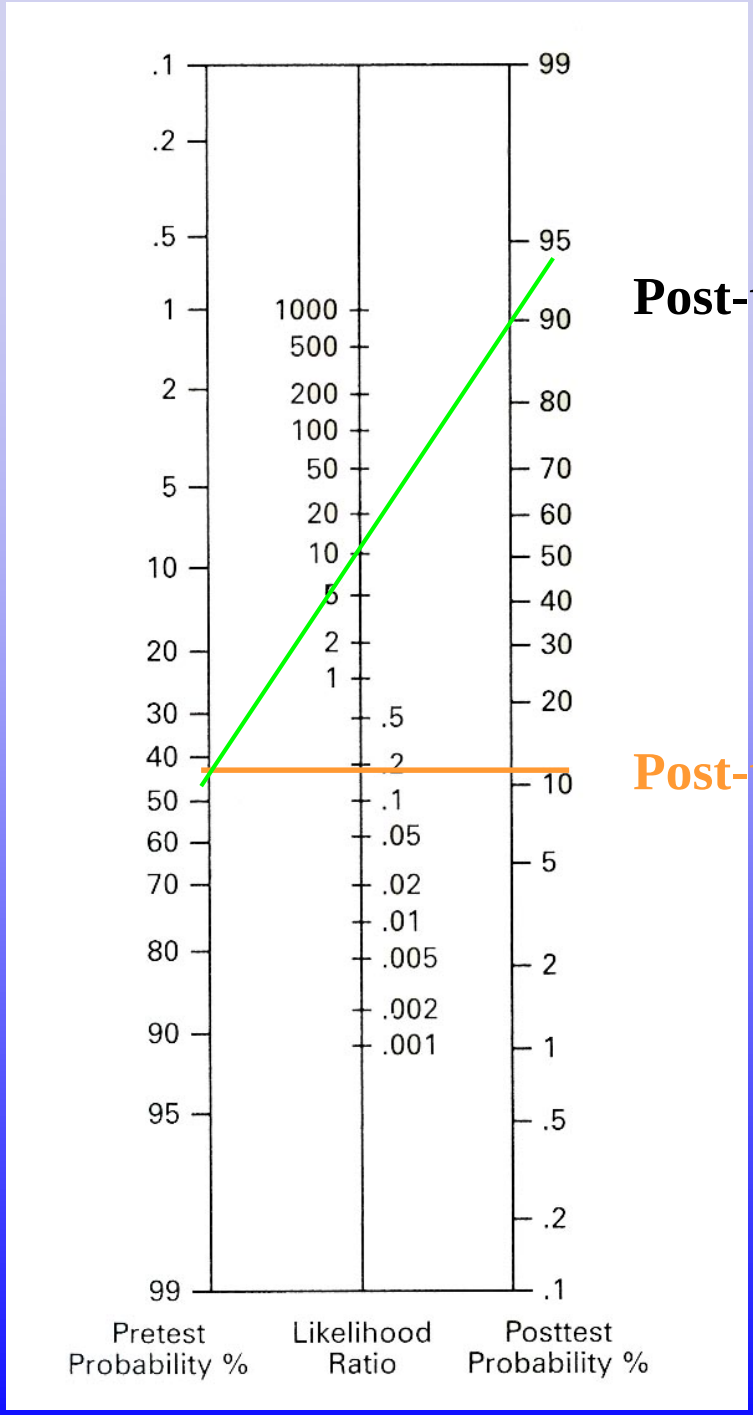
SAD Level	Depression: Present	Depression: Absent	
>150	50	5	LR = 11
100-150	25	20	LR = 1.5
<100	15	85	LR = 0.2

Likelihood Ratio Nomogram

- On left side, select pretest probability
- Straight line through center at LR
- Continue to right side, to posttest probability



Pre-test probability 45%



Post-test probability ~90%

Post-test probability ~12%

Mr. Cox – 80y/o

How are you feeling about his care?

- **Rheum team evaluated:** feels all from spinal stenosis, rotator cuff, fracture, immobility. Agrees no synovitis, **but "worried about the high Anti-CCP so consider starting hydroxychloroquine". "Get hand films to find erosions,** do PT, & NHP. **Doubt PMR."**

- **Next morning:** Best night of sleep in long time. Helped feed self. Able to participate with PT evaluation
- **Following morning:** bright affect and feeds self; can raise hands to shoulders without pain

Mr. Cox – 80y/o

- **Following days – while awaiting Rehab placement – eating like horse; takes laps in hallways with walker**
- Daughter tearfully exclaims that it's a miracle
- Altho no boney erosions, rheum remains very concerned that he's at very high risk for RA **("ACCP is very specific for RA") and needs hydroxychloroquine.** Suggest rapid prednisone taper down to 6mg and then they'd see him in 3months **(we countered)**

Think Out Loud: WHY is it so hard for our rheum colleagues to let go of RA?

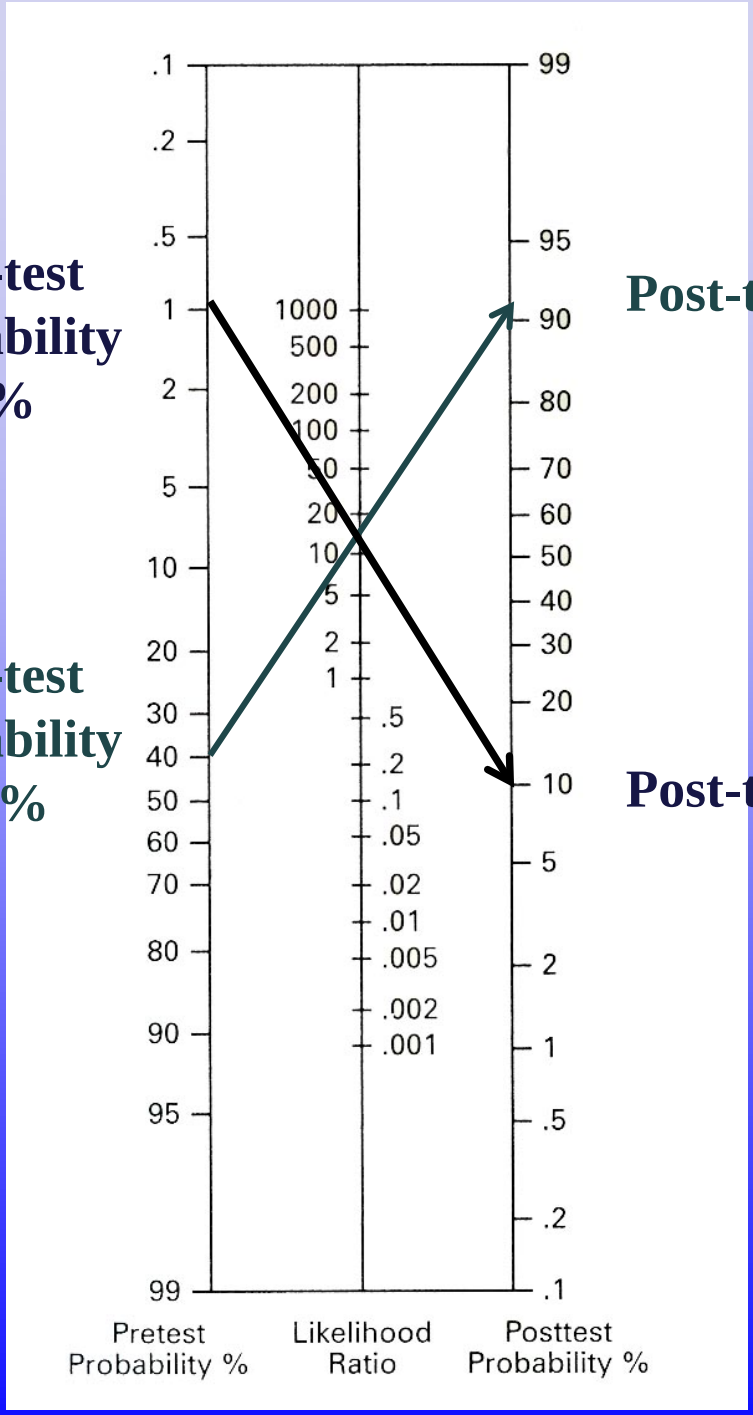
Mr. Cox – 80y/o

- **Anti-CCP has a sensitivity of 58% and specificity of 96%**
- **LR(+) = 14.5**
- **LR > 10 … Result in large changes in post-test probability**

Systematic Review: Accuracy of Anti-CCP for Diagnosing RA
Ann Int Med 2010; 152:456-464

Pre-test probability 1%

Pre-test probability 40%



Post-test probability >90%

Post-test probability ~10%

Key Take Home Messages

1. Ddx should be a verb
2. For 2x2 box, orient ‘Truth’ from on high
3. For Sen/Spec/PPV/NPV …
   name *denominator first*
4. LRs are the Doc’s friend
5. LR are just a ratio of likelihoods

Savor Your EBM Learning & Teaching in Tasty Slices