

**Please Gather
Up Front**

(so we can keep each other awake)

Considering Key Components of Clinical Diagnosis



Mark C. Wilson, MD, MPH
Associate Dean, Graduate Medical Education
Carver College of Medicine
Associate Hospital Director for GME
University of Iowa Hospitals & Clinics

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Disclosures

- I have no financial or non-financial conflicts of interest
- However, I do sport a southwestern drawl honed in West Texas ...
- My passion past 30yrs: Create learning opportunities for resident/fellow physicians to become better than their faculty



Raygun
Unpaid Advertisement



Wagons from Kocs, Hungary



Overarching Directions View

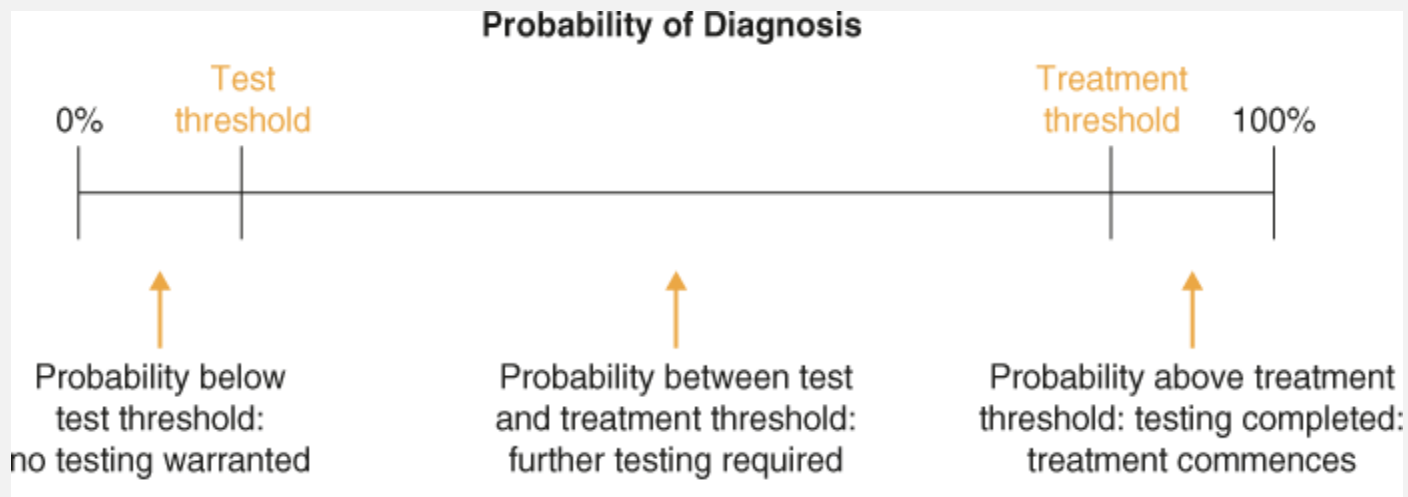
(e.g. from google maps app)

- Inspire all of us to explore – & pursue mastery – in diagnostic reasoning ...
through teaching slices
- Practice Simple Math & English
- Practice Avoiding Formulas
- Enjoy Fun Interaction

Granular (Paper) Road Map View

- **Differential Diagnosis & thresholds**
- **Why address muddled diagnostic thinking**
- **Tackle 2x2 tables**
- **Explore LRs as**
 1. **Doctor's Friend**
 2. **Ratio of likelihoods**
- **Consolidation Case**
- **Kocs, Hungary**

Probabilities & Thresholds



Richardson, Wilson. 'The Process of Diagnosis' Users' Guides to Medical Literature 3rd ed 2015

**We Can Learn A Lot
from 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)

When Considering Ddx

Is Differential Diagnosis ...
a List or an Active Process?

	'Possibilistic' List	'Probabilistic' Reasoning
Physician Effort	Memorize all possibilities	Thoughtfully regard the list based on ...
Type of Thinking	Consider all known causes	<u>Actively reorder</u> list based on: <ul style="list-style-type: none">• Patient Context• Probabilistic• Prognostic• Pragmatic

**Let's put these notions into
action with a real patient**

Let's have a think-about

Walter is 27y/o thin cook

- Presents to ER with fatigue and abd pain & n/v
- Afeb, 150/85, HR 115, RR 20, Abd soft & NT
- Fatigue, polydipsia, nocturia & 20# wt loss past month
- UA 3+ gluc, 2+ ketones
- WBC nl; Gluc – 405; HCO₃ – 6; Anion Gap – 28
ABG – 7.02 / 12 / 125
B-Hydroxybutyrate – 8

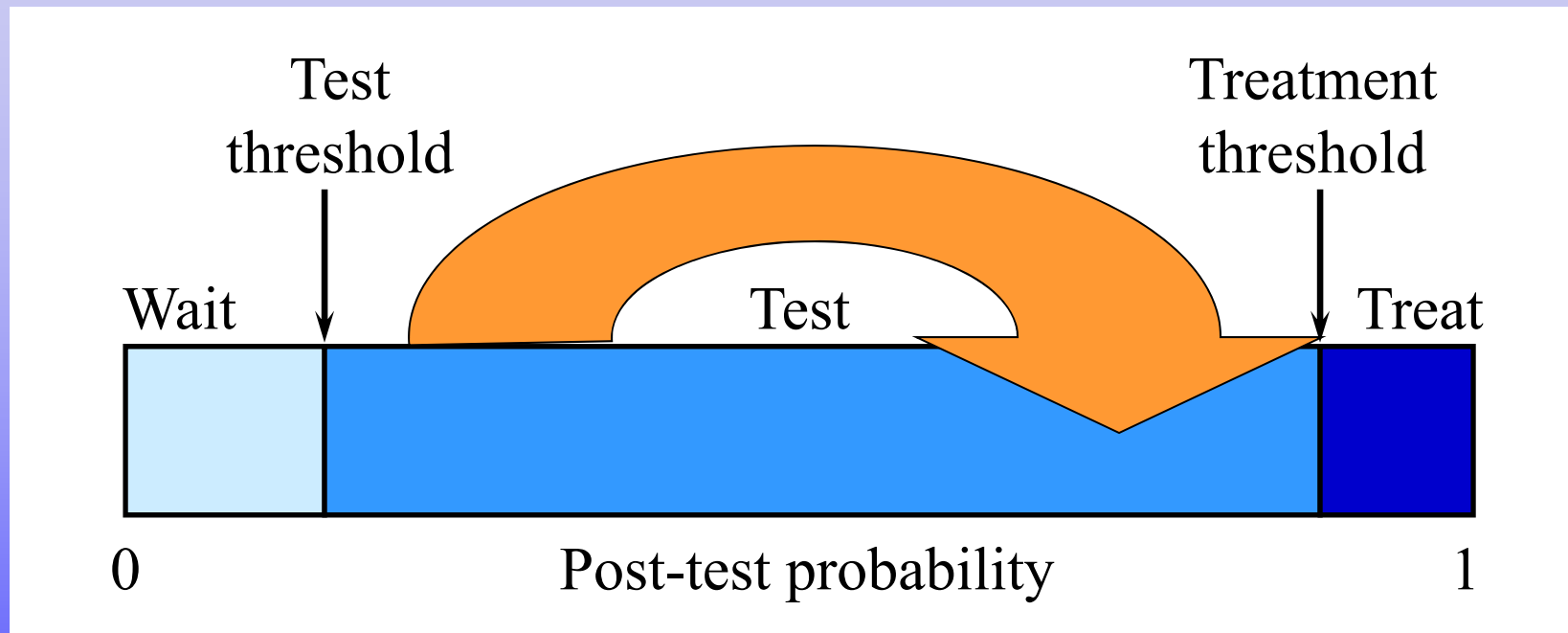
Let's have a think-about

Consensus is 99+% certainty of IDDM

- And already past treatment threshold for insulin b/o clinical predicament
- After discharge, surprisingly I received the result of a 'send out lab' result (i.e. >\$400!)
- Glutamic acid decarboxylate antibody (GAD-Ab) >250

Did we still have diagnostic uncertainty?

Cross a Threshold?



**Dx tests most useful when results push probability across one of the thresholds, leading to a specific action:
wait... test further... or treat**

Must consider if a difference in clinical
care plans can still be gained ...
by attempting to keep trying to
minimize uncertainty

**“A difference, to be a difference,
must make a difference.”**

Gertrude Stein
(1874 – 1946)

The 2 X 2 Table

TRUTH (Dz)

Present

Absent

Pos

Dx Test

Neg

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

The 2 X 2 Table

Neurohormone SAD levels
in 200 dazed lowans after
a tough winter

Depression

		<i>Depression</i>	
		Present	Absent
SAD Level	>150	50	5
	≤150	40	105

The 2 X 2 Table

Neurohormone SAD levels
in 200 dazed lowans after
a tough winter

Depression

		<i>Depression</i>	
		Present	Absent
SAD Level	>150	50	5
	≤150	40	105

PPV = 50/55
91%

NPV =

Sen =
50/90=56%

Spec =
105/110=95%

The 2 X 3 Table

Neurohormone SAD levels
in 200 dazed lowans after
a tough winter

Depression

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

**We Need a 2nd Generation
Diagnostic Test Performance
Measure ...**

The Noble Likelihood Ratio

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?**

**What was Helpful that
You Could Try in Your
Own Teaching?**

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, but 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”
- **Overnite Admitting Assessment:** RA, needs NHP
- **At 7:30am:** Diffuse aches, especially in shoulders and some hips; Fell on ice & broke left humerus; managed with immobilization; 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 past 6mon**
daughter wonders maybe: **“cause he can’t barely feed himself”**
- 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

Rheum Evaluation: Believes all from spinal stenosis, rotator cuff, fracture, immobility. Agrees no synovitis, **but “worried about the high Anti-CCP so consider starting hydroxychloroquine”**. **“Doubt PMR.”**

Results of Therapeutic Trial of Steroids

- **Next morning:** Best night of sleep; Helped feed himself.
- **Following morning:** bright affect & feeds self; can raise hands to shoulders without pain
- **Following days:** while awaiting Rehab placement, eating like a horse; takes laps in hallways with walker
- Daughter tearfully exclaims: ***“It’s a miracle”***

Mr. Cox – 80y/o

Think Out Loud with Me ...

WHY was it so hard for our rheum colleagues to let go of RA?

What aspects of diagnostic reasoning in this case would you teach about?

Mr. Cox – 80y/o

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

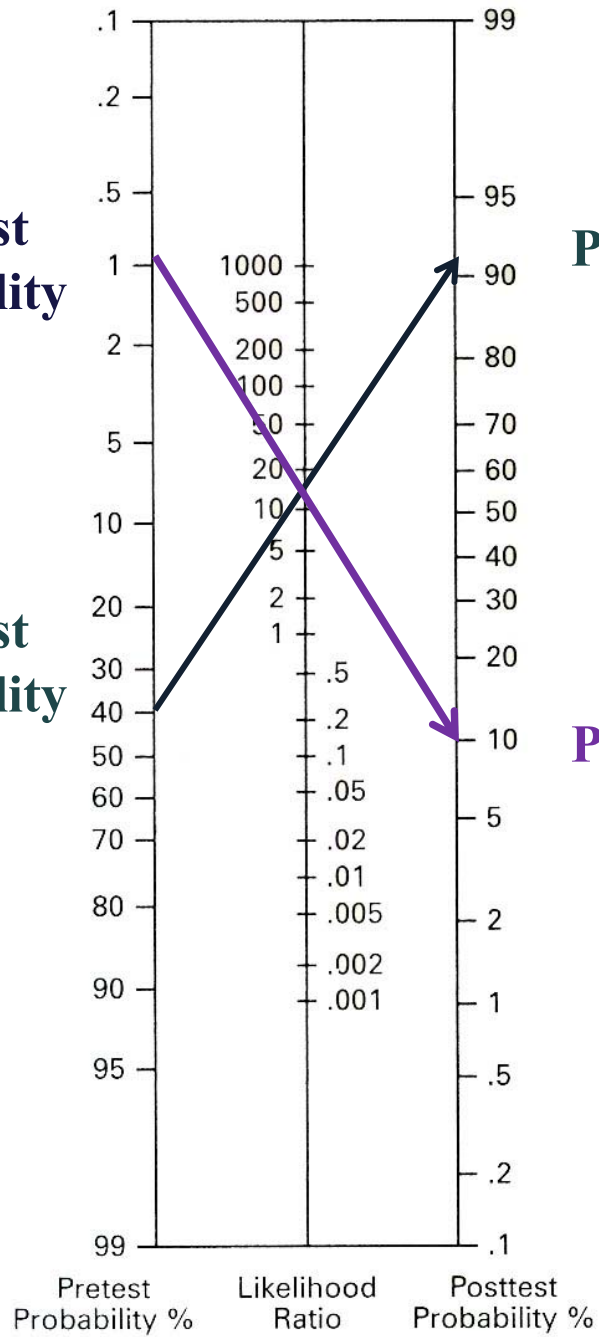
*Systematic Review: Accuracy of Anti-CCP for Diagnosing RA
Ann Int Med 2010; 152:456-464*

**Pre-test
probability
1%**

**Pre-test
probability
40%**

Post-test probability >90%

Post-test probability ~10%



Wagons from Kocs, Hungary



Coach Etymology

The Word 'Coach'

Arises from horse-drawn wagons or carriages

- 1830s Oxford

- 1860s Athletic Coaches appeared

- To help take or move someone from *where they are to where they want to be*
- It's a guiding process to improve performance
- Focused on specific skills/tasks/capabilities

Key Take Home Messages

Patients and learners deserve clinicians with rational diagnostic reasoning

1. Ddx should be an active process
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***
6. ***Coach*** ourselves, colleagues, & learners

Savor Your EBM Learning & Teaching in Tasty Slices

