Pretest Probability — Why Positive Tests Lie

Bayes Without the Math

Every diagnostic test has a sensitivity and specificity — but those numbers alone do not tell you what a result means in your patient. What matters equally is the **pretest probability**: how likely is this diagnosis before the test is ordered? A positive result in a low-probability patient is usually a false positive. A negative result in a high-probability patient is often a false negative.

Part 1 — What Is Pretest Probability?

Pretest probability is your clinical estimate of disease likelihood before any test is run. It comes from the history, physical exam, and risk factors — not the lab. It is not a calculation. It is a judgment.

> **Key principle:** The same positive test result means something very different depending on who you ordered it in. In a low-probability patient, most positives are false. In a high-probability patient, most negatives are false.

Why this happens — without the math:

A test with 95% sensitivity and 95% specificity sounds excellent. In a population where only 1% of patients truly have the disease, roughly 95 out of 100 positive results are still false positives. The test did not change — the population did. This is not a flaw in the test. It is a consequence of ordering it in the wrong patient.

Part 2 — D-dimer and PE: A Concrete Example

D-dimer is highly sensitive for pulmonary embolism (PE) but has poor specificity. It rises with infection, malignancy, pregnancy, recent surgery, and age. Ordered without pretest probability assessment, it generates far more false positives than true positives.

Patient	Clinical Picture	What D-dimer Positive Means
High pretest prob.	Wells ≥5: recent long flight, unilateral leg swelling, tachycardia, no alternative diagnosis	Likely true positive. Proceed to CT-PA.
Low pretest prob.	Wells <2: healthy 22-year-old, pleuritic chest pain, no leg swelling, no risk factors	Likely false positive. D-dimer was the wrong test.

> **Clinical scenario:** A 22-year-old with pleuritic chest pain and no risk factors has a D-dimer of 0.55 (reference <0.50). The reflex is to order a CT-PA. The correct move is to recognize this was a low-probability patient who should not have had a D-dimer ordered in the first place. A PERC score of zero would have ended the workup at the bedside.

The PERC Rule: In patients with low pretest probability for PE, the PERC rule (8 criteria) can exclude PE without any lab testing if all 8 criteria are negative: age <50, HR <100, SpO_2 ≥95%, no unilateral leg

swelling, no hemoptysis, no recent trauma/surgery, no prior DVT/PE, no exogenous estrogen. All 8 negative = stop. No D-dimer needed. This is the correct sequencing: establish pretest probability first, apply a clinical decision rule second, order a lab test only if still indicated.

Part 3 — Testing Strategy by Pretest Probability

Pretest Prob.	Example (PE)	Testing Strategy	Risk of Error
Low	Wells <2, PERC negative	No testing needed. Stop.	False positive if you test
Low-Mod	Wells <2, PERC positive	D-dimer first; CT-PA only if elevated	Still risk false positive
Intermediate	Wells 2–4	D-dimer; CT-PA if positive	Balanced
High	Wells ≥5	Skip D-dimer. Go straight to CT-PA.	False negative if you rely on D-dimer

Bottom line on testing sequence: In high-probability patients, a negative D-dimer does not rule out PE — sensitivity is not 100% and the prior probability is too high. In low-probability patients, a positive D-dimer rarely means PE — specificity is too low. Both errors lead to the wrong management.

CLINICAL RULE

Order tests to change management, not to confirm what you already think. A test ordered in a low-probability patient usually generates a false positive that leads to more testing and harm. Establish the pretest probability first.