



Evidence Based Diagnosis



When a Patient Has a Problem

The doctor reaches a diagnosis by:

- **Clinical data**
- **Diagnostic tools**



Increasing use of investigations:

- Availability.
- The urge to make use of new technology.

New Diagnostic tests



The evaluation of diagnostic techniques is less advanced than that of treatments (**NO** phase I, II, III, IV).



Relevance

- First, the test should be one that is feasible for you in your community
- Example: brain biopsy is an accurate test for diagnosing dementia, it's not practical for my (living) patients!



Validity

- Was it compared to a gold reference standard?



So

- Is reference standard used acceptable?
- Were both reference standard and test applied to all patients?



Ask yourself

- Did the patient sample include an appropriate spectrum of patients to whom the diagnostic test will be applied in clinical practice?



Rule of Thumb

- at least 100 participants to ensure an appropriate "spectrum" of disease



Independent

- the decision to perform the reference standard should ideally be independent of the results of the test being studied.

2 x 2 table comparing the results of a diagnostic test with a reference standard



	reference standard	
	disease	no disease
test abnormal	true pos. [a]	false pos. [b]
test normal	false neg. [c]	true neg. [d]



sensitivity

- probability of a positive test among patients with disease
- i.e Ability to diagnose



Appraising the Literature Regarding Diagnostic Tests

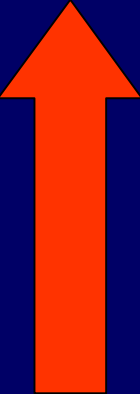
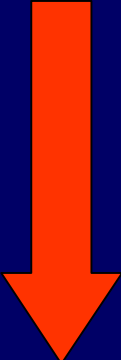
	Condition Present	Condition Absent
Test Positive	True Positive	False Positive
Test Negative	False Negative	True Negative



specificity

- probability of a negative test among patients without disease
- i.e Ability to exclude

2 X 2 Table



a (true positive)	b (false positive)
c (false negative)	d (true negative)

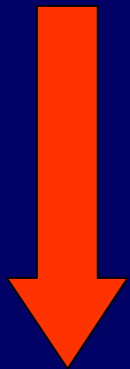
Statistics needed to know



- **prevalence** = probability of disease in the entire population at any point in time (i.e. 8% the Egyptian population has diabetes mellitus)
- **incidence** = probability that a patient without disease develops the disease during an interval (the incidence of diabetes mellitus is 0.6% per year, referring only to new cases)



	Condition Present	Condition Absent
Absent		
Test Positive	True Positive A	False Positive B
Test Negative	False Negative C	True Negative D
	SENSITIVITY $A/(A+C)$	SPECIFICITY $D/(B+D)$





Keep in Mind

- sensitivity and specificity by themselves are only useful when either is very high (over typically, 95% or higher).

Who wants what ?



	main interest	dependency
Methodologist	sensitivity specificity	test
Doctor	accuracy	test and disease
Patient	Probability	disease and test



Likelihood Ratios

- LR means

probability of an individual **with** the condition having the test result
probability of an individual **without** the condition having the test result

LR+ =

probability of an individual **with** the condition having a positive test
probability of an individual **without** the condition having a positive test



- $LR^- =$

probability of an individual **with** the condition having a negative test

probability of an individual **without** the condition having a negative test

- $LR^+ = \text{sensitivity} / (1 - \text{specificity})$

- $LR^- = (1 - \text{sensitivity}) / \text{specificity}$



Why LR

- The LR+ corresponds to the clinical concept of "ruling-in disease"
- The LR- corresponds to the clinical concept of "ruling-out disease"

Interpreting likelihood ratios



LR	Interpretation
$10 <$	Large and often conclusive increase in the likelihood of disease
$10 - 5$	Moderate increase in the likelihood of disease
$5 - 2$	Small increase in the likelihood of disease
$2 - 1$	Minimal increase in the likelihood of disease
1	No change in the likelihood of disease
$1.0 - 0.5$	Minimal decrease in the likelihood of disease
$0.5 - 0.2$	Small decrease in the likelihood of disease
$0.2 - 0.1$	Moderate decrease in the likelihood of disease
$0.1 >$	Large and often conclusive decrease in the likelihood of disease

Appraising the Literature Regarding Diagnostic Tests

- What characterizes a good test?
 - Large +LR (>5.0)
 - change the odds favoring the diagnosis given a + test
 - helpful for *ruling in* the condition.
 - Small -LR (<0.30)
 - reduce the odds favoring the diagnosis given a - test
 - helpful for *ruling out* the condition.

Finally



- **Will the results Help Me in Caring for My Patients?**

Patient oriented !!!!!!!



- Your 45 year old patient has a mammogram. The study is interpreted as "suspicious for malignancy" by your radiologist.
- Your patient asks you: "Does this mean I have cancer?", and you (correctly) answer "No, we have to do further testing."



- Your patient then asks, "OK, I understand that the mammogram isn't the final answer, but given what we know now, what are the **chances that I have breast cancer?**".



Is it Easy!!!

- Assume that the overall risk of breast cancer in any 45 year old woman, regardless of mammogram result, is 1%. Assume also that mammography is 90% sensitive and 95% specific. Then, select your answer below:

1% 15% 60% 85% 95%



THANK YOU