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Likelihood Ratio

The Likelihood Ratio (LR) represent a new way to look at data and apply them to clinical situations. The LR is more applicable to clinical situations that the more familiar sensitivity and specificity. The LR is combined with the clinician's pre-test probability to derive a post-test probability. The Likelihood Ratio (LR) represents accuracy and allows the clinician to apply this number to a pretest probability (clinician's "best guess" about whether a condition exists before testing). The resultant post-test probability helps in the diagnostic decision-making process.

In order to better understand the LR, one should *quickly* review sensitivity and specificity. The 2x2 table below helps illustrate these familiar concepts.

	Disease Present	Disease Absent
Test Positive	a	b.
Test Negative	c	d

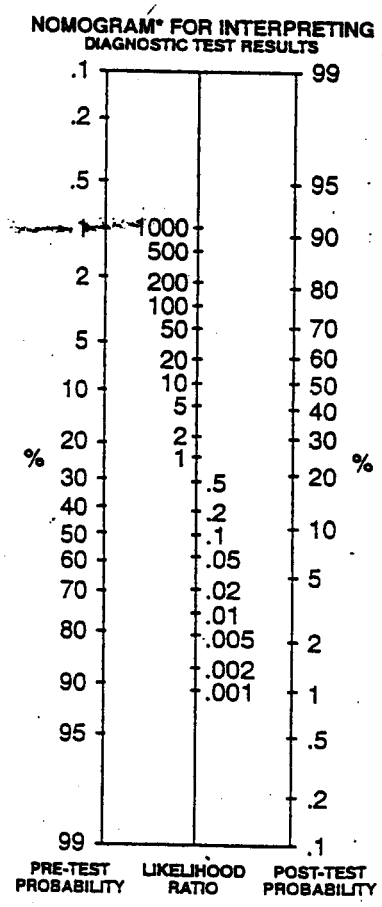
Sensitivity = a/(a+c)
Specificity = b/(b+d)
LR (+) = sens/(1-spec)
LR (-) = (1-sens)/spec
PPV = a/(a+b)
Prevalance = (a+c)/(a+b+c+d)

The likelihood ratio is applied to the pretest probability by means of a nomogram (developed by Fagan), which is shown on the right. The number is not simply multiplied by the pretest probability. One uses a straight edge with the left edge on the pretest probability and then through the center line representing the LR. Where the straight edge intersects the right-sided line is the post-test probability.

LRs less than 0.10 and greater than 10 make significant changes from pre-test to post-test probability. LRs around 1.0 make no difference. The greater the ability of the test to discriminate a diagnosis, the greater the LR.

Perhaps the most difficult part in applying the LR is the pre-test probability. This represents the clinician's "best guess" about the presence of the disorder. The pre-test probability should not be pulled out of the air but is derived from the disease prevalance, clinical situation, objective data and clinical experience.

Another important concept is whether the result of a test will change the way you treat the patient. If you are convinced that a disease is present and will treat despite the result(s) of a diagnostic test, then the LR will likely not affect your treatment or the patient outcome. It would also be reasonable to say that you should not even order the test.



The concept of LR can be applied to a common clinical problem --alcoholism. The landmark CAGE Study demonstrated that a few, simple questions could predict the presence of an alcohol problem. The simple questions are:

C: have you ever CUT down on your drinking?
A: do people ever ANNOY you about your drinking?
G: do you ever feel GUILTY about your drinking?
E: do you ever need an EYE-OPENER?

Likelihood Ratios From CAGE Study (CMJ. 1983;129:947)

	# of Yes Answers	Abusers	Non-Abusers	Likelihood Ratio
CAGE RESULT	3 or 4	60	1	250
	2	28	14	7
	1	11	28	1.3
	0	18	358	0.2
TOTAL		117	401	