The likelihood ratio (LR) is a measure of the accuracy of a diagnostic test: that is, the degree to which the test tests what you want it to test compared to the gold standard. The LR is a type of odds ratio: the probability of a given test result in patients with disease over the probability of the same result in patients without disease.

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LR = \frac{\text{Probability (odds) of given test result in patients with disease}}{\text{Probability (odds) of given test result in patients w/o disease}}
\]

The LR can be used to calculate the posttest probability corresponding to a known pretest probability (prevalence) and test result using a published nomogram. In other words, if you have an idea about the likelihood of a condition before you do the test, the LR can predict how much more or less likely the condition is, based on the test result. Sensitivity and specificity are also measurements of diagnostic test accuracy. Recall that sensitivity is the probability a test will be positive in the presence of disease and specificity that a test will be negative in the absence of disease (see: "Weighing the Evidence," AAP Grand Rounds, June 2003;9:65). The LR has an advantage over sensitivity and specificity in that it may be calculated for more than 2 levels of a test result. Sensitivity/specificity can be used to describe dichotomous values only, eg, positive or negative.

If the LR equals 1, the posttest probability is the same as the pretest probability. An LR greater than 1 increases the likelihood that the disease is present, while an LR less than 1 reduces the likelihood of the condition. While LRs sometimes are not reported in studies of diagnostic test accuracy, they may be calculated readily.

In clinical decision-making, LRs may be very helpful in determining the clinical utility of a diagnostic test. Although there are not exact rules for which level of LR is clinically important, an LR greater than 10 or less than 0.1 is believed to indicate a large change between pretest and posttest probability.

In this month's issue, the LR was used to describe the utility of cystography after the first UTI in children age 1 year or younger. Using DMSA scans as the gold standard for renal scarring, the likelihood of voiding cystourethrogram (VCUG) demonstrating vesicoureteral reflux (a positive VCUG) was 4.95 with an abnormal DMSA scan, and 0.56 with a normal DMSA scan. The LR was calculated as: 4.95 ÷ 0.56 = 8.9 (95% CI, 2.07 to 38.25). Because the level of 8.9 indicates only a modest change between pretest and posttest probability, the authors conclude that the VCUG "provides relatively little additional useful information" for managing a child with a first UTI.

References