1. It is well known from experience that any given disease occurs in different patients with varying presentations ranging from being atypical to being typical. For example, acute myocardial infarction (MI) occurs in a 40 year old healthy woman with highly uncharacteristic chest pain (1) as well as in a 65 year old man with multiple cardiac risk factors who presents with highly characteristic chest pain.

2. Our goal in diagnosis, as is well known, is to determine a disease correctly in every given, individual patient with symptoms regardless of typicality of presentation.

3. This means our goal is to determine a disease correctly regardless of prior probability of a suspected disease which is a measure of typicality of presentation. Thus our goal would be to diagnose acute MI correctly in the 40 year old woman in whom the prior probability is 7 percent (1) as well as in the 65 year old man, in whom it is, let us say, 85 percent.

4. Therefore, the notion of prior probability as prior evidence for a disease in a given, individual patient in the Bayesian method (2) serves no useful purpose in diagnosis in practice. In fact, we believe, it is likely to lead to diagnostic errors if we act upon this notion. Thus it may encourage us to rule out acute MI in the 40 year old woman and to rule it in, in the 65 year old man without further testing leading to diagnostic errors if acute MI is present in the former and absent in the latter patient.

5. The notion of prior probability merely indicates, we suggest, the chance and not prior evidence of a disease being present in a given patient. Its only role, we suggest, is in prioritizing the order in which various suspected diseases are evaluated by tests in a non-urgent diagnostic situation.

6. We have pointed out that evidence for a disease by a test result in a given patient is represented correctly by a likelihood ratio only which indicates a change in odds (probability) of the disease in a particular patient (3).
7. Similarly, we suggest,, ( prior ) evidence for a suspected disease by a presentation in a given patient is represented by a likelihood ratio.

8. We find that the likelihood ratio for any presentation, regardless of how typical or atypical it is, is around 1, indicating it does provide any significant prior evidence.
   For example, the likelihood ratio for a high prior probability ( greater than 80 percent ) presentation of suspected pulmonary embolism has been found to be less than 2 ( 4 ).

9. Therefore in general , any presentation merely provides us clues which make us suspect a disease which we then formulate as a diagnostic hypothesis.

10. Rarely however, a presentation may have a high likelihood ratio, for example, presentation with unilateral, blistering, painful skin lesions in a patient with suspected herpes zoster.
   In this patient, the presentation has a high likelihood ratio which provides not only clues but strong evidence from which we diagnose this disease definitively in a patient.

11. In diagnosis in practice, as we have pointed out, a suspected disease as a diagnostic hypothesis is evaluated by performing a test ( 3 ).
   If a test result with likelihood ratio greater than 10 is observed, the suspected disease is diagnosed definitively in practice regardless of prior probability ( 5 ).
   For example, observation of acute Q wave and ST elevation EKG changes ( acute EKG changes ) with likelihood ratio of 13 ( 6 ) leads to a definitive diagnosis of acute MI in the 40 year old woman ( 1 ) as well as in the 65 year old man.

12. The accuracy of diagnosis of acute MI from acute EKG changes across patients with varying presentations ( prior probabilities ) has been found to be 85 percent ( 6 ).
   This observed ( experienced ) diagnostic accuracy is employed in practice, we suggest, by a confidence argument ( 7 ) to diagnose acute MI with a high degree of confidence in a given patient with acute EKG changes regardless of prior probability.
13. It seems to us the development of a test capable of generating a result with likelihood ratio greater than 10 is a key factor in increasing accuracy of diagnosis of a disease in patients with varying prior probabilities. This is seen in the case of pulmonary embolism whose diagnostic accuracy in patients with varying prior probabilities increased markedly with development of perfusion lung scan (high probability lung scan likelihood ratio 14) (8) and chest CT angiogram (positive result likelihood ratio 20) (9).

14. In conclusion, a likelihood ratio is employed to assess evidence for a disease at every stage of the diagnostic process due to our goal of diagnosing a disease correctly in every given, individual patient regardless of presentation (prior probability).

References


