Data or Information? That Is the Question

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Many physicians complain about the abundance of diagnostic data they have to cope with: technological developments have increased the number of diagnostic tests dramatically and this number will continue to grow. On the other hand, physicians order far too many diagnostic tests; studies show high variation between physicians with respect to the type and the number of diagnostic tests, as well as subsequent therapeutic decisions, when this is not accounted for by patient characteristics (*1*). This situation has led to an increased effort to create clinical policies or guidelines intended to enhance quality of care and reduce costs.

Although the creation of guidelines might be tremendously beneficial, it is doubtful whether the results of the diagnostic procedures are being used optimally. Does the cardiologist really know the exact prognosis of a patient with a normal thallium scintigram or the additional diagnostic value of the scintigram in a patient with chest pain and an equivocal ECG for the diagnosis of coronary artery disease? Probably not. At least not every cardiologist who is presented with such a patient and such diagnostic data. Yet, extensive research is done on these subjects. Patients need to benefit from this research and want to be informed about their particular case to the utmost detail.

To be able to do that, it is necessary that physicians make predictions in a formalized manner. Determining diagnosis, prognosis and therapy and deciding on monitoring intervals and screening and preventive maneuvers all involve making probabilistic statements (*2*). The limitations of the intuitive use of (diagnostic) information and the subsequent shortcomings in the accuracy of decisions is well documented. The inaccuracy of data is often not taken into consideration (*3*); the importance of similar cases is often overrated; the tendency to stick to the first judgment; the overestimation of the physician's own skills and judgments; and the undesirability of a particular diagnosis all affect the physician's final judgement in a negative way (*4*).

There is an ever-widening gap between the increasing quality of diagnostic departments and the clinicians who order far too many diagnostic tests and do not use high quality diagnostic data to their full extent. What, however, can the diagnostic department do about that?

In the first place, the diagnostic departments should be skeptical about introducing new tests and technological developments for routine clinical use. For instance, SPECT technology is rapidly replacing the old planar scintigram for diagnosis of coronary artery disease. This involves a large investment but does it really improve the diagnosis? In the second place, the diagnostic departments should answer the often latent questions of the clinicians who ordered the tests. In practice, the result of a diagnostic procedure is often only communicated, but the real questions remained unanswered: Is the disease present? What is the prognosis, and what might be the result of treatment? In our view, the diagnostic department should translate the result of a diagnostic procedure into information. Tools to perform this task are available and more are being developed (*5*). There must be close collaboration between the clinician and diagnostic department to achieve this goal.

Let us give some examples. In patients with a normal thallium scintigram, the incidence of cardiac death or myocardial infarction varies between 0.5% and 3.5% after 1 yr, but the magnitude of this risk depends on the cardiac history (*6*). The diagnostic departments probably know this dependency better than a given clinician, and this knowledge should accompany the result of the diagnostic test. Staniloff et al. (*7*) showed that the probability of coronary artery disease depends on sex, age, angina complaints, magnitude of the exercise-induced electrocardiographic ST-segment depression and thallium scintigram results. For instance, a 50-yr-old male patient with atypical angina and a 1.7-mm ST-segment depression has a 85% risk of having coronary artery disease (*7*). If the thallium scintigram also shows a nonreversible defect, the risk will be 90%; if the scintigram is normal, the risk still is 52%. Few clinicians are aware of such detailed knowledge. Of course, they could use the diagnostic department's information if they are familiar with Bayesian or multivariate statistics, but in practice this will not happen. Work pressure is too high and the detailed knowledge is lacking.

The diagnostic department is, however, in the right position to generate this detailed information. It has the data first, and has the best knowledge about test characteristics (sensitivity, specificity). The physician's judgment has been shown to improve significantly when combined with modeled information (*2*). The challenge is for the diagnostic department to translate data into information so that patients are optimally treated.

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