We would like to underline the emphasis on evaluation research as it is prescribed in McNeil and Hanley's paper. Both the growing complexity of the diagnostic, therapeutic, and rehabilitative potential at the disposal of the physician and the increased cost from the excessive use of technologies of not necessarily proven efficacy and utility call on the responsibility of the medical and health professions to amplify their efforts to provide evaluation studies of high quality. It is quite true that one impediment to not having more evaluation studies done might be the scarcity of research funds directed to this area. Nevertheless one should try to stimulate a change in mentality in health care professionals as to the status of evaluation studies, which are often considered second rate from a scientific point of view.

McNeil and Hanley's paper shows well that highly scientific and intellectual reasoning is necessary for evaluation studies. The paper presents clinical work to test the usefulness of two new methods that should be considered important contributions to the methodology of evaluating diagnostic techniques: (1) The receiver operative characteristics (ROC) method, which we would describe as a method of measuring the combined sensitivity and specificity of the technology taking into account the variation that might result from subjective interpretation of the results; (2) the concept of maximum attainable discrimination (MAD), which can be used to analyze whether a reduction in the number of patients to be examined by a specific diagnostic method can be achieved without undue loss of its analytic power and vital clinical information. We will comment briefly on both methodologies but first we would like to take a somewhat broader approach to the methodology of evaluating new medical technologies in general.

The activities of the World Health Organization (WHO) Regional Office for Europe's unit for Appropriate Technology for Health are concentrating on the development of a health technology assessment network. In this network several institutes with different disciplinary backgrounds from different countries will engage to embark jointly in the area of evaluation. In the preparatory activity for this network we have found that it is fundamental to have a multidisciplinary approach. Also, we found that with the present state of affairs it is very difficult, though not impossible, to organize this multidisciplinary collaboration successfully. It appears that as a first approach it is necessary to consider evaluation in a rather broad sense combining in a systematic way all existing evidence on efficacy, technical quality, safety, cost-effectiveness, and patient and social acceptability of medical technologies.

Although it is very tempting to try and develop some sort of overall index of utility of a technology to compare with the financial resources that are spent in provid-
ing the respective service, for various reasons, especially with the case of diagnostic technologies, this has been difficult to achieve and so we are left with a weak methodology assessing the relation between effectiveness and technical quality of a technology and its expected impact on health outcome. The ROC method presented is a very elegant method of establishing the relative accuracy of a diagnostic technique, relative to any other (standard) technology. Swets et al. (1979) have already indicated in their paper on the ROC method that this method should be considered as a basis for further evaluation of the utility of a diagnostic technology. It would also include elements of medical efficacy, risk associated with a use of a particular technology, and cost evaluation. This type of evaluation, sometimes described as formal clinical decision analysis, involves the use of probability of responses from the use of diagnostic and therapeutic technologies in terms of health outcome.

The ROC method provides a good basis for determining the probability distribution in formal clinical decision analysis. An estimate of the cost involved may be compared with a net benefit in terms of health outcome. Alternatively it is feasible to try and estimate the extent to which an improved diagnostic technique would improve therapeutic management or make a rough prognosis of health outcome. Goitein (1980) used this type of estimation to provide indications of the cost-effectiveness of computed tomography (CT) in cancer radiation therapy by comparing the increment in benefit in terms of health outcome due to CT with the cost of diagnosis and therapy. CT was found to be cost-effective by a factor of 5.5 over traditional methods. Other studies have concluded that CT is cost-effective over traditional diagnostic methods used in the diagnoses of brain diseases (Jonsson et al. 1976; Barral 1980).

Cost analysis in these cases also deals with cost savings that might be achieved because CT would replace other more expensive technologies involving hospitalization and a much higher risk to the patient. These methods are pneumoencephalography and cerebral angiography in the case of brain scanning. This leads us to a point that very often proves crucial in the discussion of policy implications of imaging technologies like CT scanning. Although CT scanning in itself might be more cost-effective than other diagnostic technologies, savings will be achieved only when suitable organizational changes of improvements can take place, redistributing the available capacity of competing techniques that might also to some degree be considered as complementary. Availability of more than one technique seems to be correlated with the defensive use of more overlapping information than is strictly necessary.

So the answer to an appropriate use of imaging technologies would seem to be a proper planning system – possibly on a regional basis – assuring collaboration between several diagnostic centres that would concentrate on one or two technologies and provide services to those patient categories that have been demonstrated, in terms of health outcome, to benefit from the technology. This would enable: (1) maximum accessibility to all facilities of patients in need of a specific technology (assuming that not all the institutions would be able to purchase all diagnostic technologies); (2) sufficient work load for each unit can be obtained to justify experienced staff in a centre and provide high quality health care; (3) sufficient work load assures optimum economic utilization of a unit. The reasoning behind this is that although a technology might be both effective and cost-effective in itself, savings at